US 20220004600A1

(19) United States
(12) Patent Application Publication
Bangole et al.
(10) Pub. No.: US 2022/0004600 A1
(43) Pub. Date: Jan. 6, 2022

(54) **IN-VEHICLE CONTENT DELIVERY SYSTEM OPERABLE IN AUTONOMOUS MODE AND NON-AUTONOMOUS MODE**

(71) Applicant: **GOGO BUSINESS AVIATION LLC**, Broomfield, CO (US)

(72) Inventors: **Premkumar Bangole**, Bloomingdale, IL (US); **Bryan Adrian Lauer**, Chicago, IL (US); **Patrick J. Walsh**, Naperville, IL (US); **Kathy Wang**, Buffalo Grove, IL (US)

(21) Appl. No.: **17/478,070**

(22) Filed: **Sep. 17, 2021**

Related U.S. Application Data

(63) Continuation of application No. 16/257,972, filed on Jan. 25, 2019, now Pat. No. 11,138,293, which is a continuation of application No. 15/222,219, filed on Jul. 28, 2016, now Pat. No. 10,235,503, which is a continuation of application No. 14/530,409, filed on Oct. 31, 2014, now Pat. No. 9,426,650.

Publication Classification

(51) **Int. Cl.**

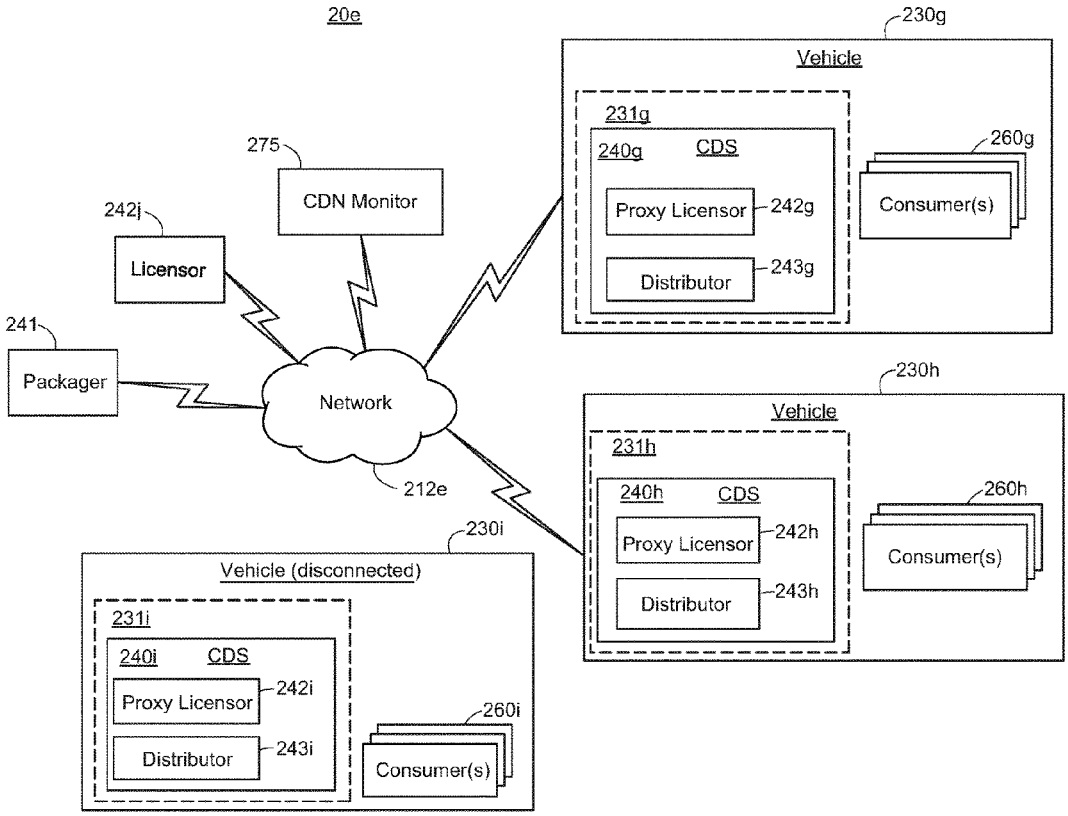
G06F 21/10	(2006.01)
H04L 29/06	(2006.01)
H04W 4/46	(2006.01)
H04L 9/08	(2006.01)
H04W 4/48	(2006.01)
H04W 12/041	(2006.01)
H04W 12/084	(2006.01)
H04W 12/0431	(2006.01)

(52) **U.S. Cl.**

CPC ***G06F 21/10*** (2013.01); ***H04L 63/10*** (2013.01); ***H04W 4/46*** (2018.02); ***H04L 9/083*** (2013.01); ***H04L 63/0428*** (2013.01); ***H04L 63/06*** (2013.01); *G06F 21/30* (2013.01); ***H04W 12/041*** (2021.01); ***H04W 12/084*** (2021.01); ***H04W 12/0431*** (2021.01); ***H04L 65/4084*** (2013.01); *H04L 63/062* (2013.01); ***H04W 4/48*** (2018.02)

(57) **ABSTRACT**

Multimedia content may be delivered to content consumer devices via a content-delivery network. Encrypted content and cryptography keys for decrypting the content may be distributed from a data center to various nodes of the content-delivery network, each node acting as a semi-independent content-delivery system. Each content-delivery system is capable of delivering received content to end-users and implementing a key-management scheme to facilitate secure content-delivery and usage tracking, even when the content-delivery system is disconnected from the data center. In other words, the disclosed systems and methods facilitate the operation of nodes which may operate in "autonomous mode" when disconnected from a larger content-delivery network, thus maintaining content-delivery capabilities despite having little if any connectivity to external networks.



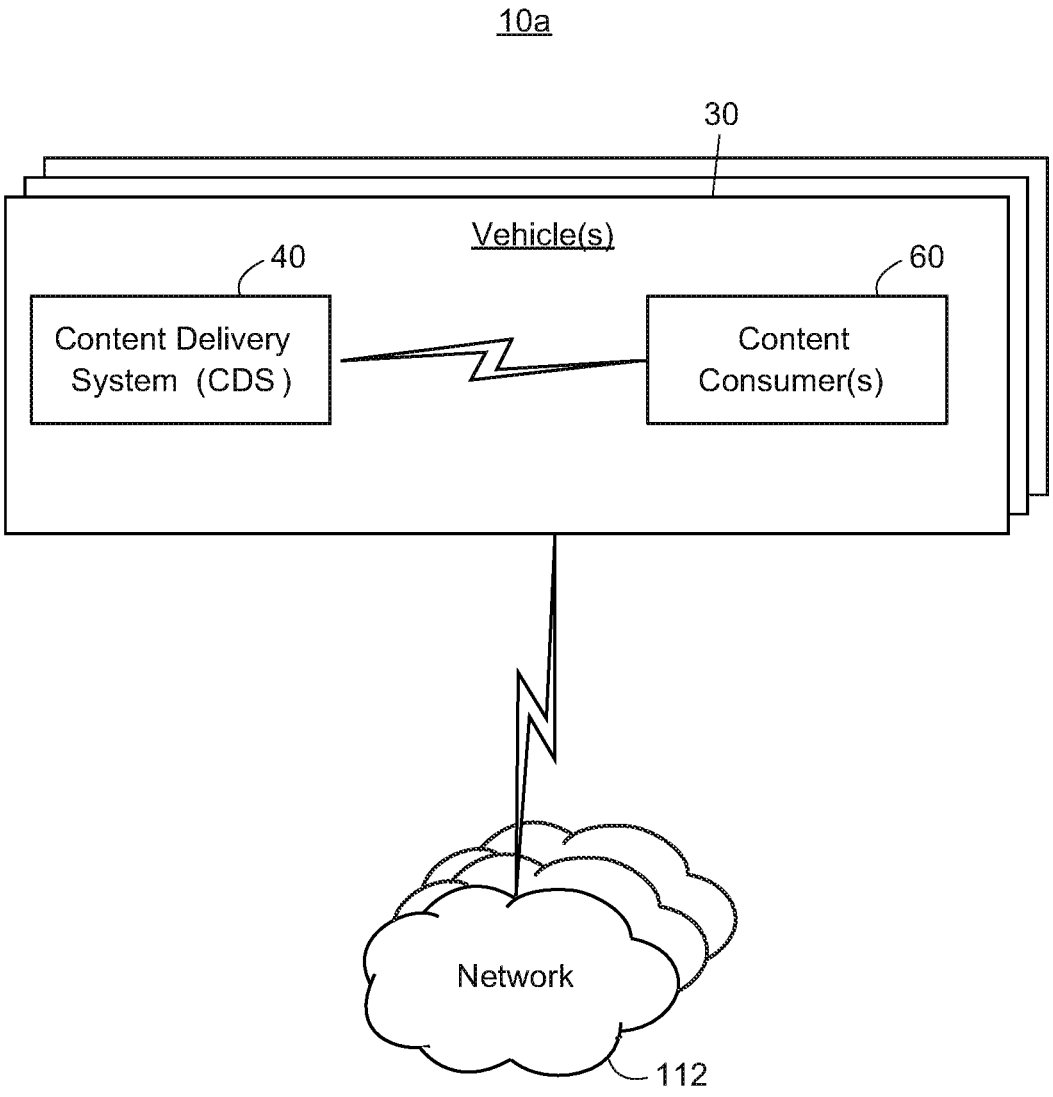

10a
30
Vehicle(s)
40
60
Content Delivery System (CDS)
Content Consumer(s)
Network
112

FIG. 1A

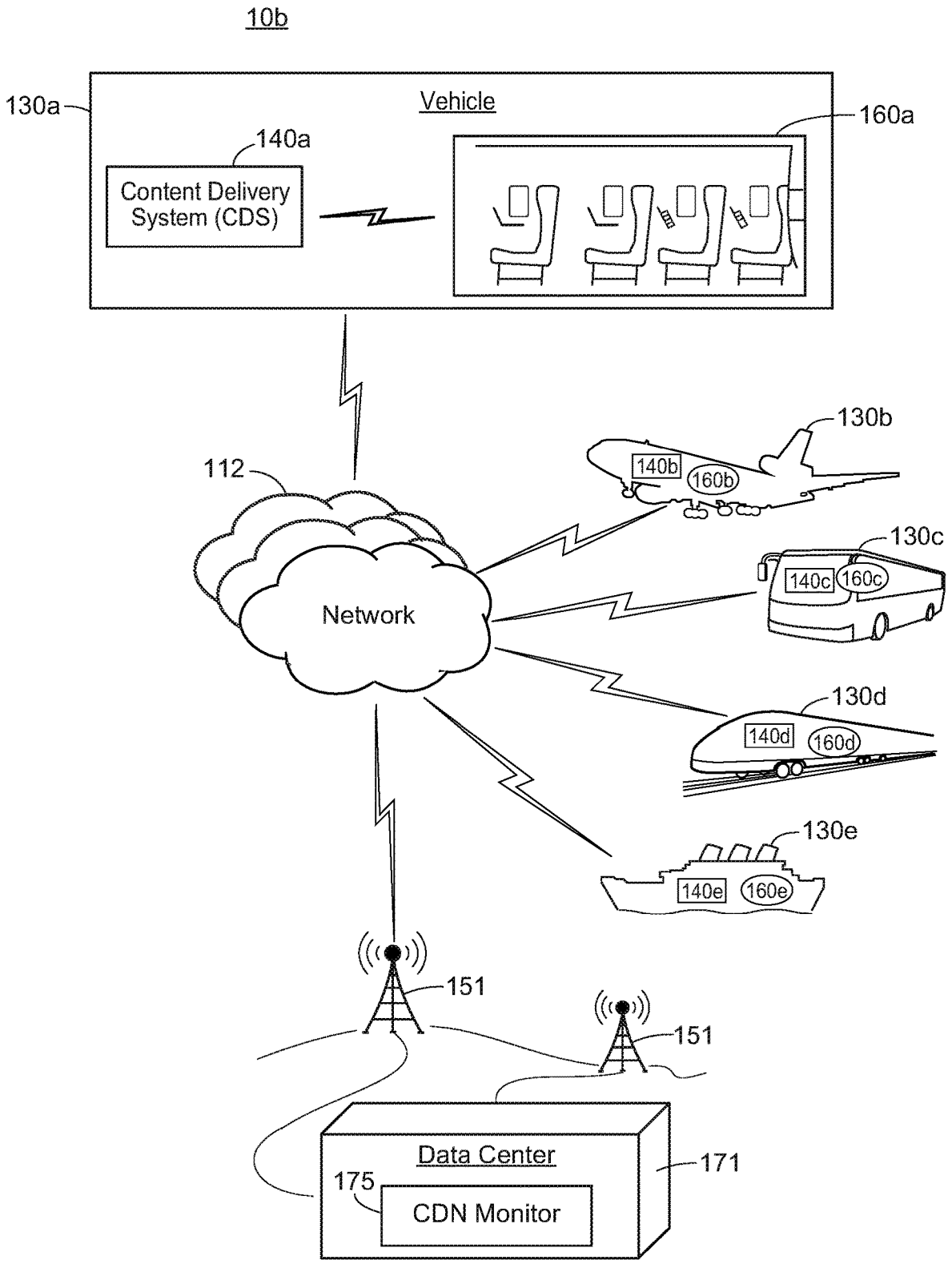

10b
130a
Vehicle
160a
140a
Content Delivery System (CDS)
130b
112
140b
160b
130c
140c
160c
Network
130d
140d
160d
130e
140e
160e
151
151
Data Center
171
175
CDN Monitor

FIG. 1B

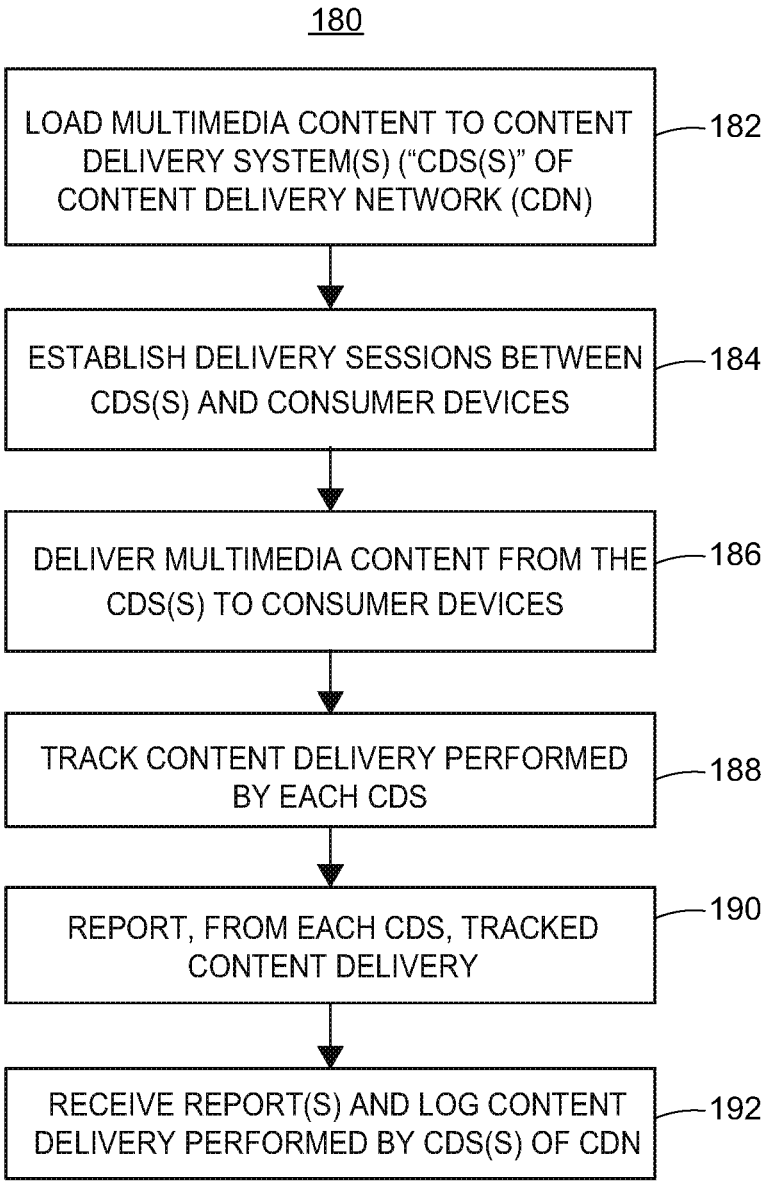

180
LOAD MULTIMEDIA CONTENT TO CONTENT DELIVERY SYSTEM(S) ("CDS(S)" OF CONTENT DELIVERY NETWORK (CDN)
182
ESTABLISH DELIVERY SESSIONS BETWEEN CDS(S) AND CONSUMER DEVICES
184
DELIVER MULTIMEDIA CONTENT FROM THE CDS(S) TO CONSUMER DEVICES
186
TRACK CONTENT DELIVERY PERFORMED BY EACH CDS
188
REPORT, FROM EACH CDS, TRACKED CONTENT DELIVERY
190
RECEIVE REPORT(S) AND LOG CONTENT DELIVERY PERFORMED BY CDS(S) OF CDN
192

FIG. 1C

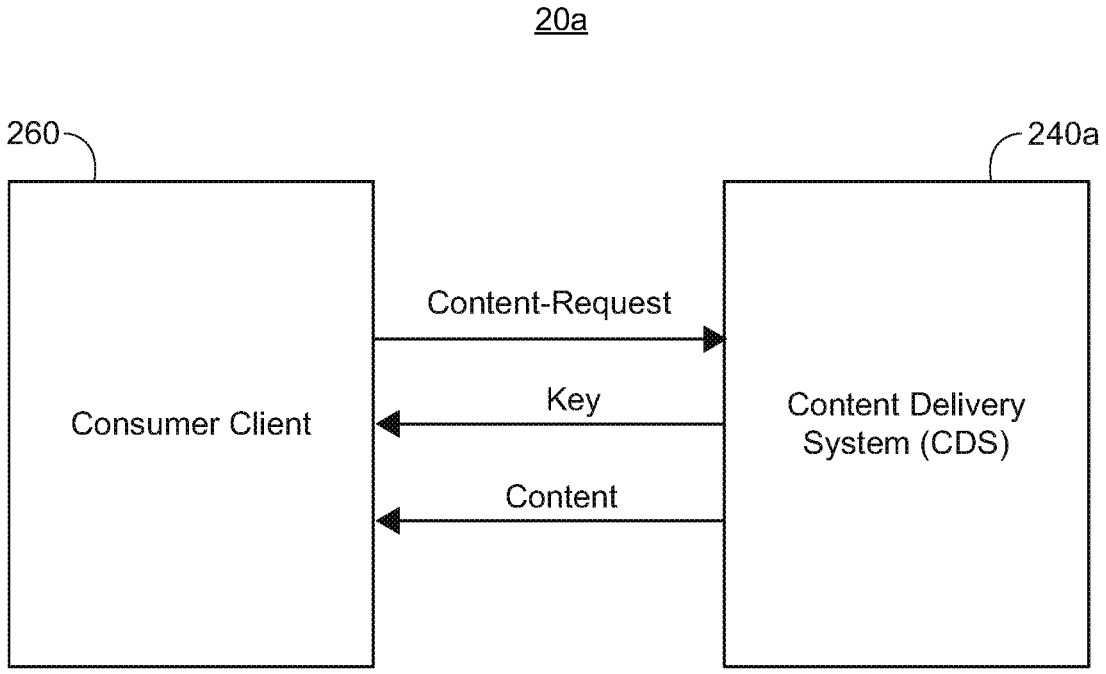

20a
260
240a
Consumer Client
Content-Request
Key
Content
Content Delivery System (CDS)

FIG. 2A

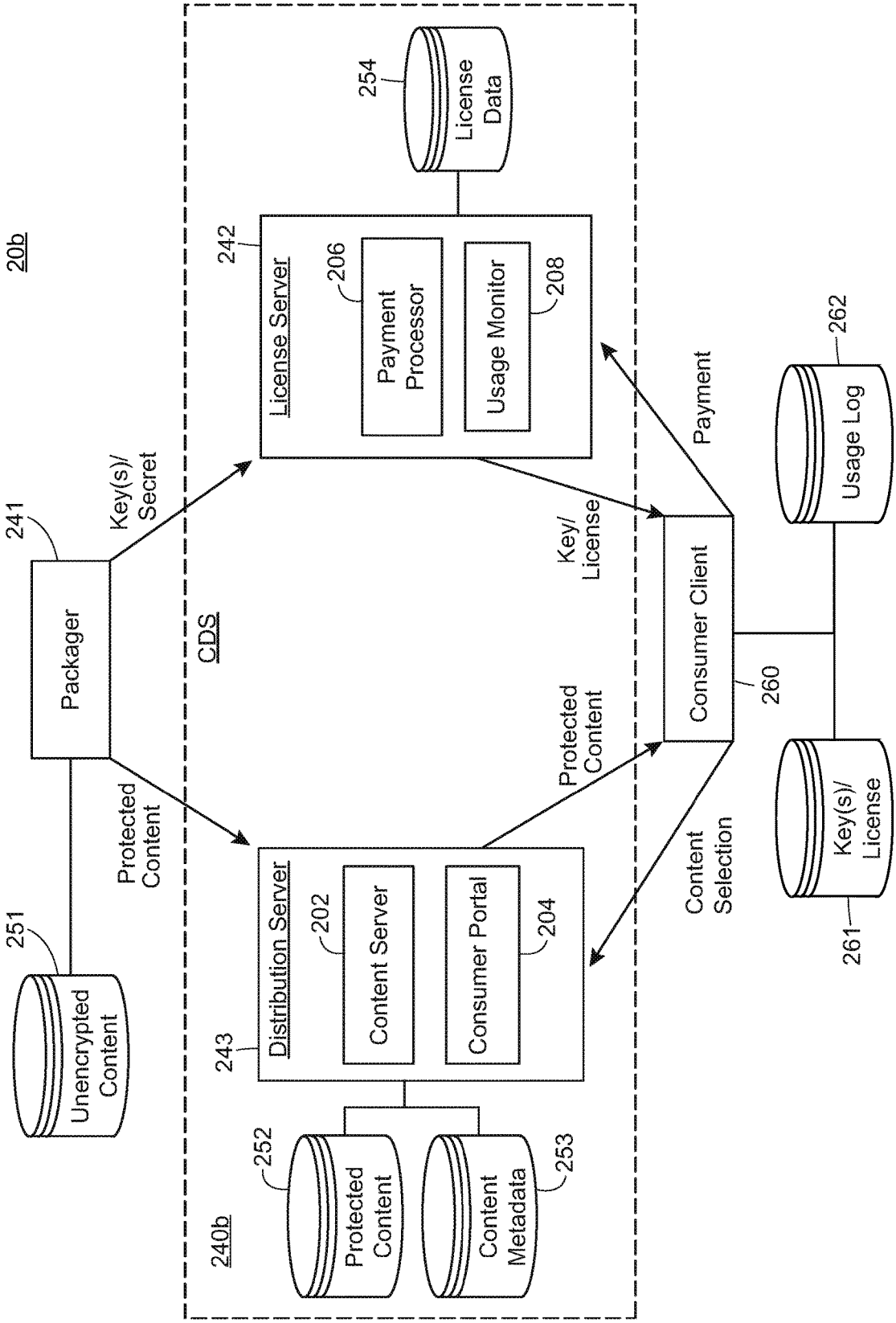

20b
241
Packager
Key(s)/
Secret
Protected
Content
251
Unencrypted
Content
CDS
242
License Server
206
Payment
Processor
208
Usage Monitor
254
License
Data
Key/
License
Protected
Content
243
Distribution Server
202
Content Server
204
Consumer Portal
240b
252
Protected
Content
253
Content
Metadata
Payment
Content
Selection
Consumer Client
260
262
Usage Log
261
Key(s)/
License

FIG. 2B

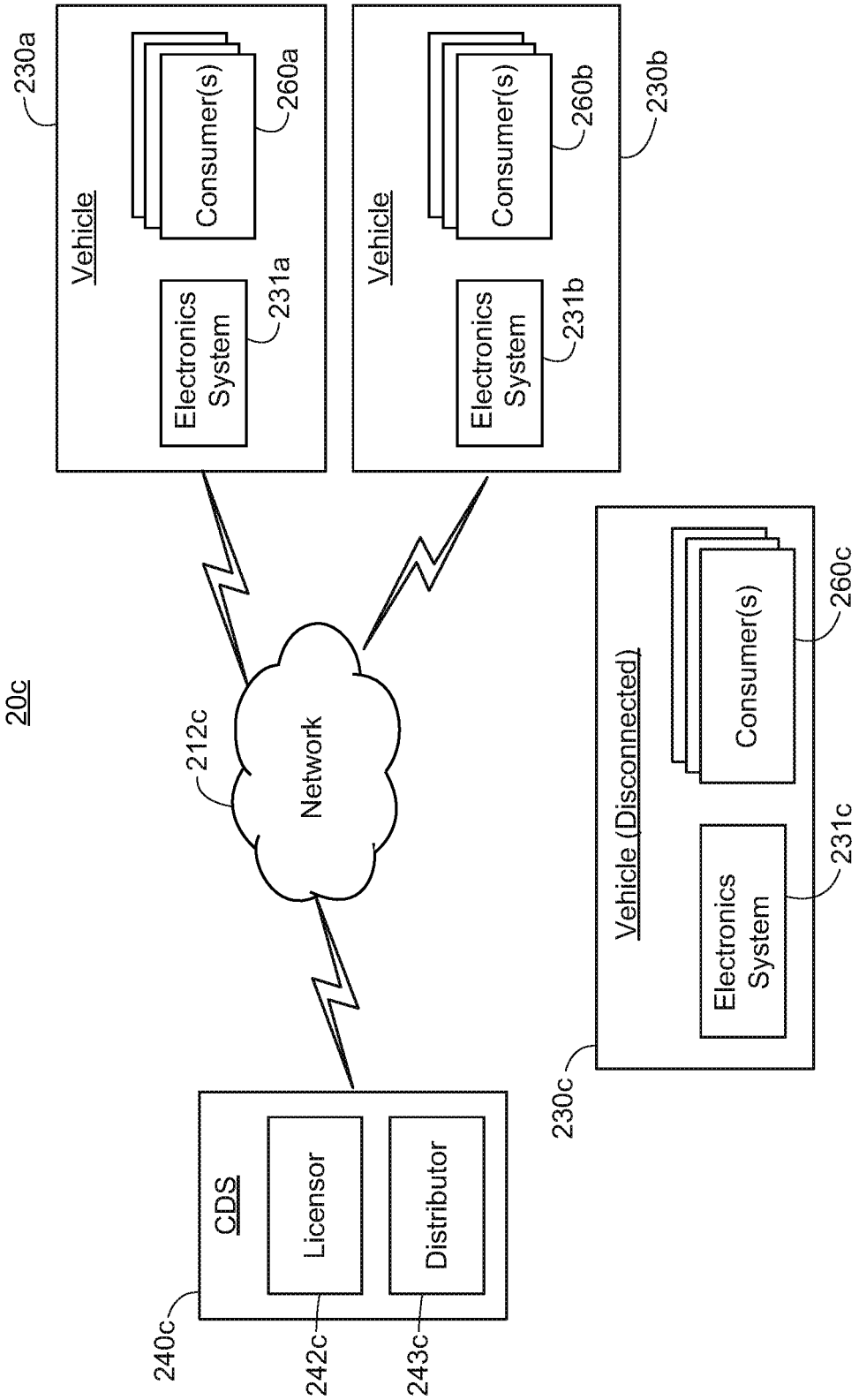

20c
230a
Vehicle
Consumer(s)
260a
Electronics System
231a
Vehicle
Consumer(s)
260b
230b
Electronics System
231b
212c
Network
Vehicle (Disconnected)
Consumer(s)
260c
Electronics System
231c
230c
CDS
Licensor
Distributor
240c
242c
243c

FIG. 2C

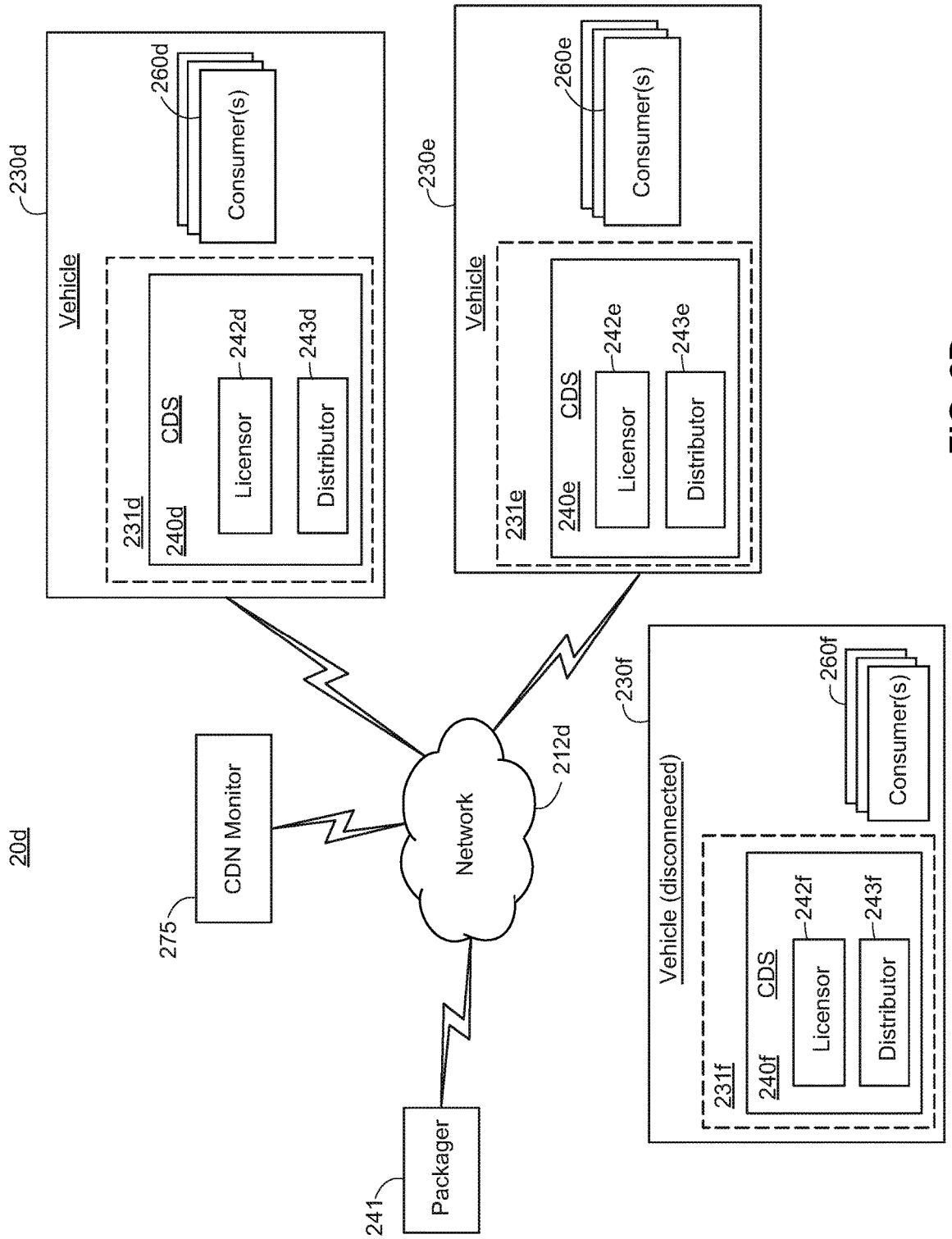

20d
230d
Vehicle
231d
240d
CDS
Licensor
242d
Distributor
243d
Consumer(s)
260d
230e
Vehicle
231e
240e
CDS
Licensor
242e
Distributor
243e
Consumer(s)
260e
230f
Vehicle (disconnected)
231f
240f
CDS
Licensor
242f
Distributor
243f
Consumer(s)
260f
Network
212d
CDN Monitor
275
Packager
241

FIG. 2D

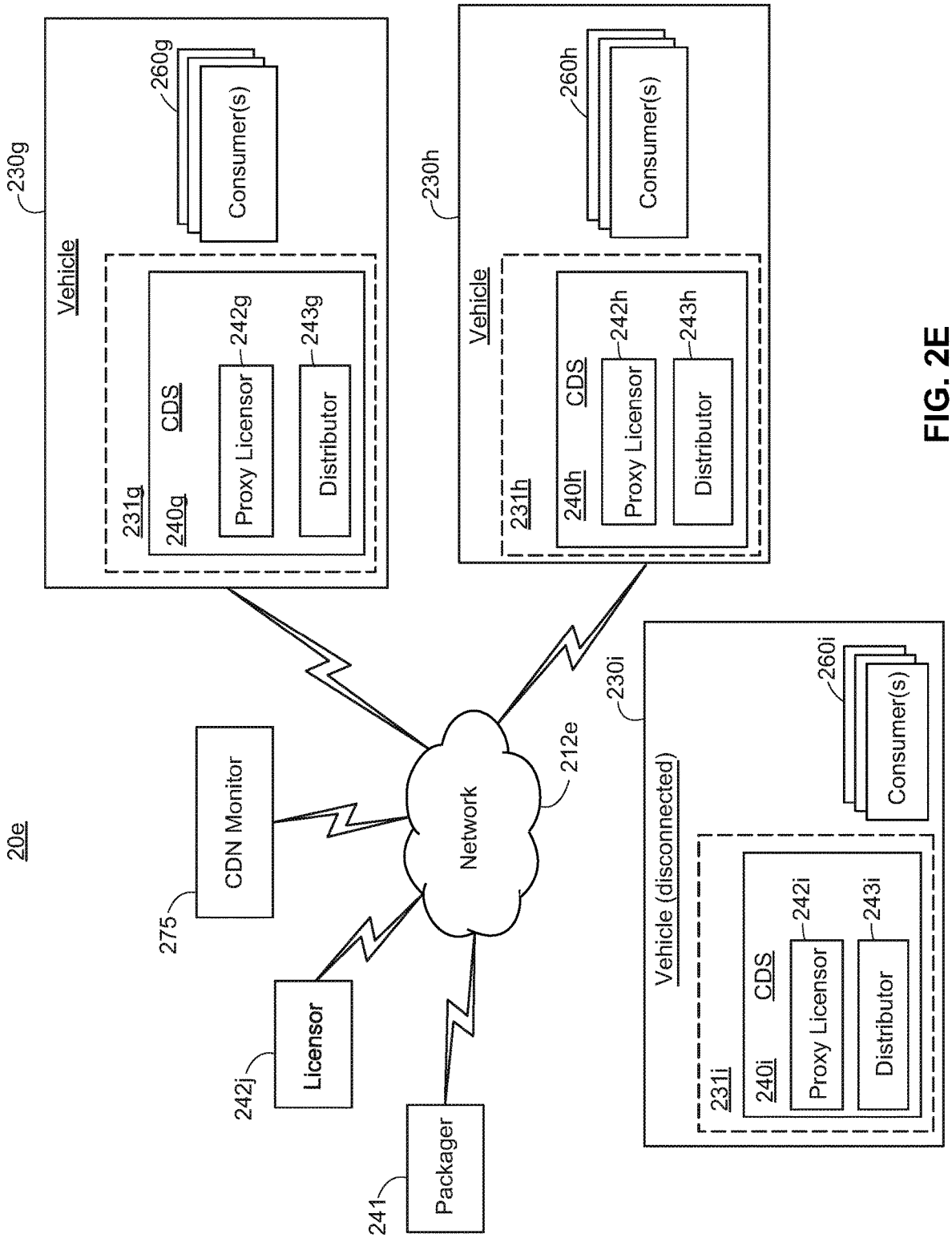

20e
230g
Vehicle
231g
240g
CDS
Proxy Licensor
242g
Distributor
243g
Consumer(s)
260g
230h
Vehicle
231h
240h
CDS
Proxy Licensor
242h
Distributor
243h
Consumer(s)
260h
230i
Vehicle (disconnected)
231i
240i
CDS
Proxy Licensor
242i
Distributor
243i
Consumer(s)
260i
CDN Monitor
275
Network
212e
Licensor
242j
Packager
241

FIG. 2E

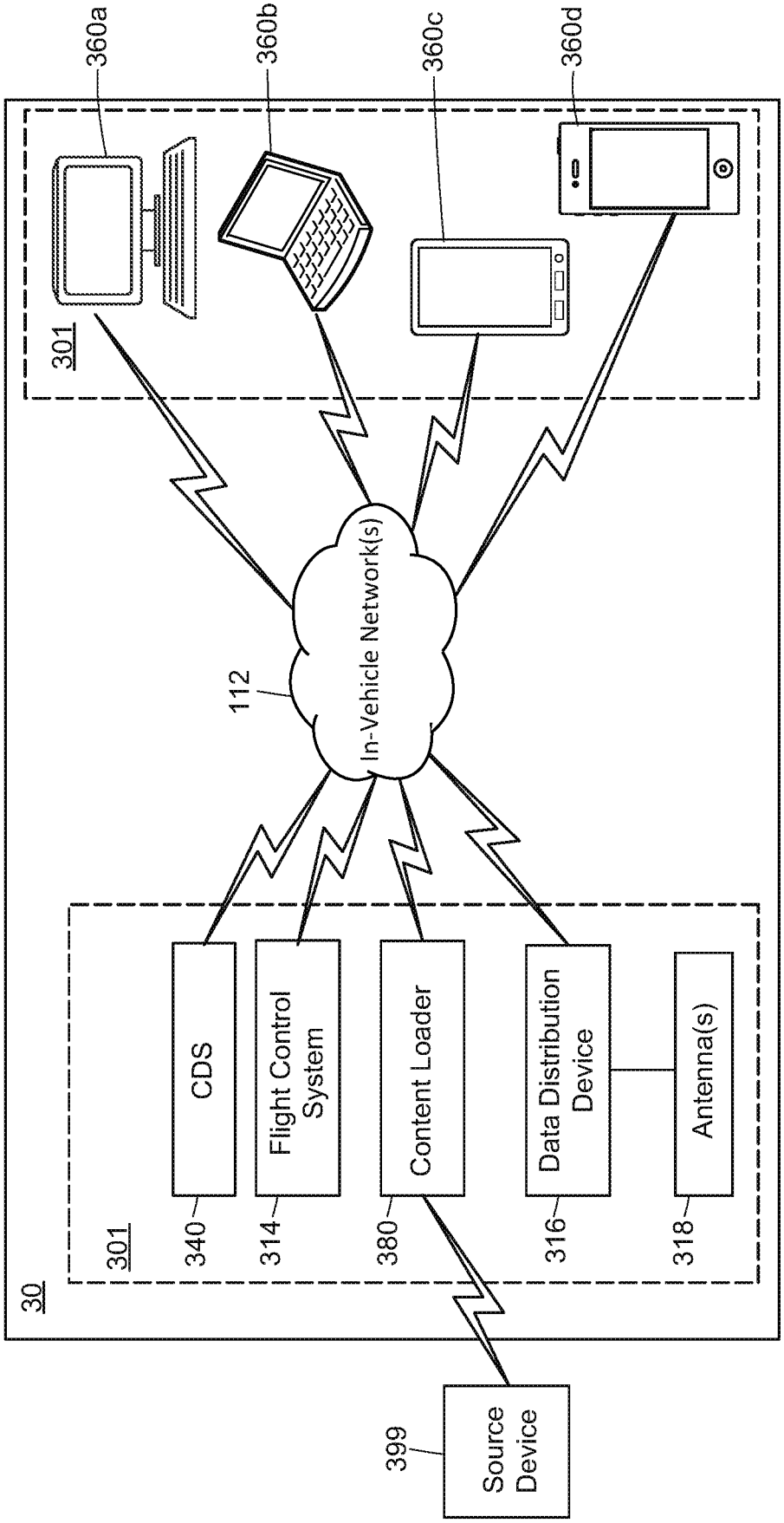

360a
360b
360c
360d
301
112
In-Vehicle Network(s)
30
301
CDS
340
Flight Control System
314
Content Loader
380
Data Distribution Device
316
Antenna(s)
318
399
Source Device

FIG. 3

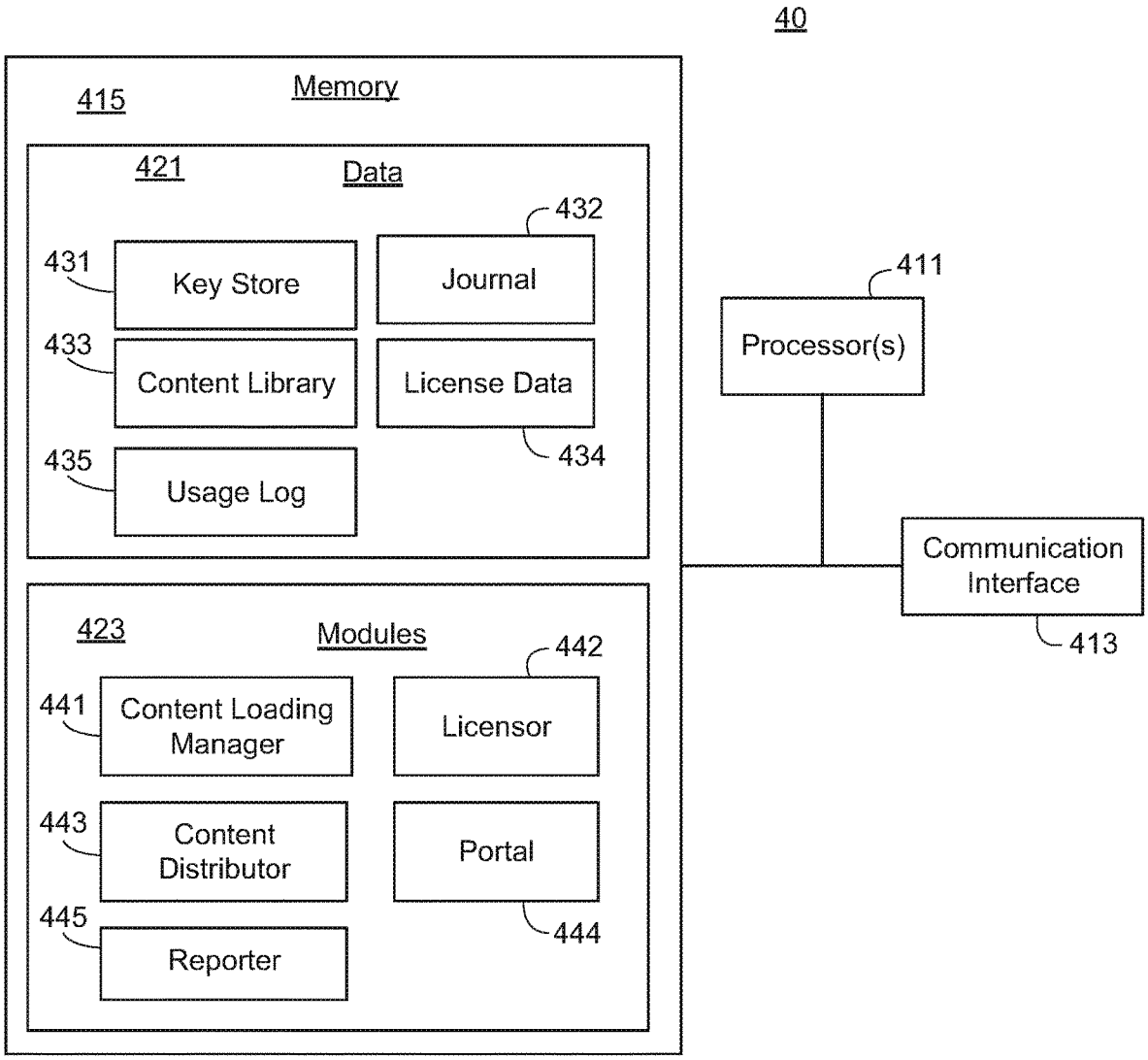

40
415
Memory
421
Data
432
431
Key Store
Journal
433
Content Library
License Data
434
435
Usage Log
411
Processor(s)
Communication Interface
413
423
Modules
442
441
Content Loading Manager
Licensor
443
Content Distributor
Portal
444
445
Reporter

FIG. 4

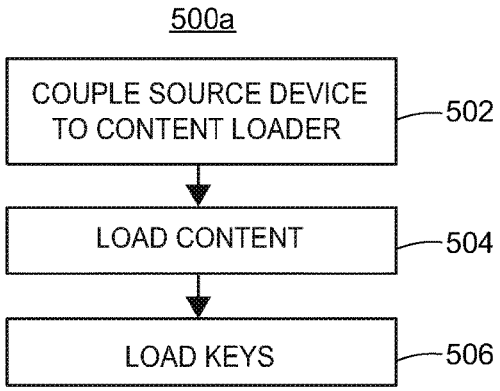

500a
COUPLE SOURCE DEVICE TO CONTENT LOADER
502
LOAD CONTENT
504
LOAD KEYS
506

FIG. 5A

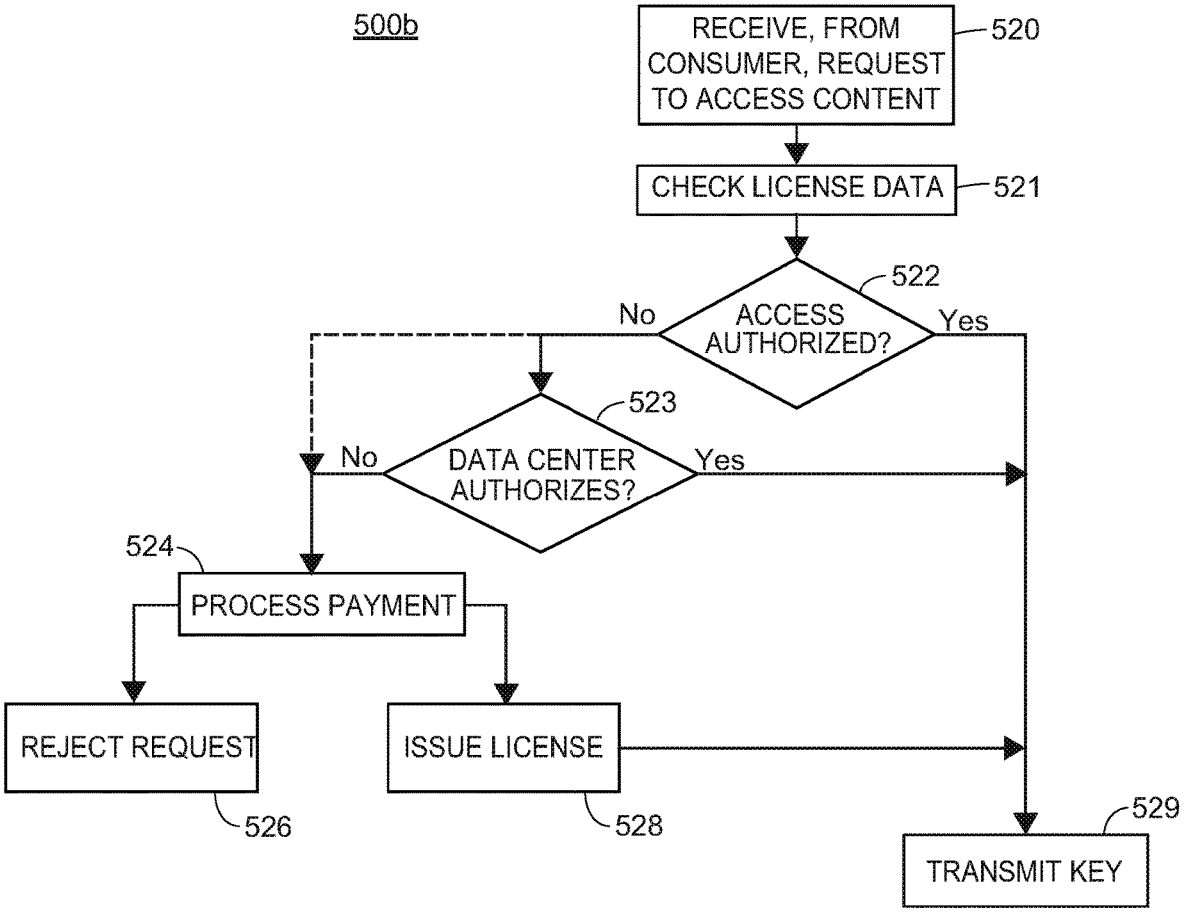

500b
RECEIVE, FROM CONSUMER, REQUEST TO ACCESS CONTENT
520
CHECK LICENSE DATA
521
ACCESS AUTHORIZED?
522
No
Yes
DATA CENTER AUTHORIZES?
523
No
Yes
PROCESS PAYMENT
524
REJECT REQUEST
526
ISSUE LICENSE
528
TRANSMIT KEY
529

FIG. 5B

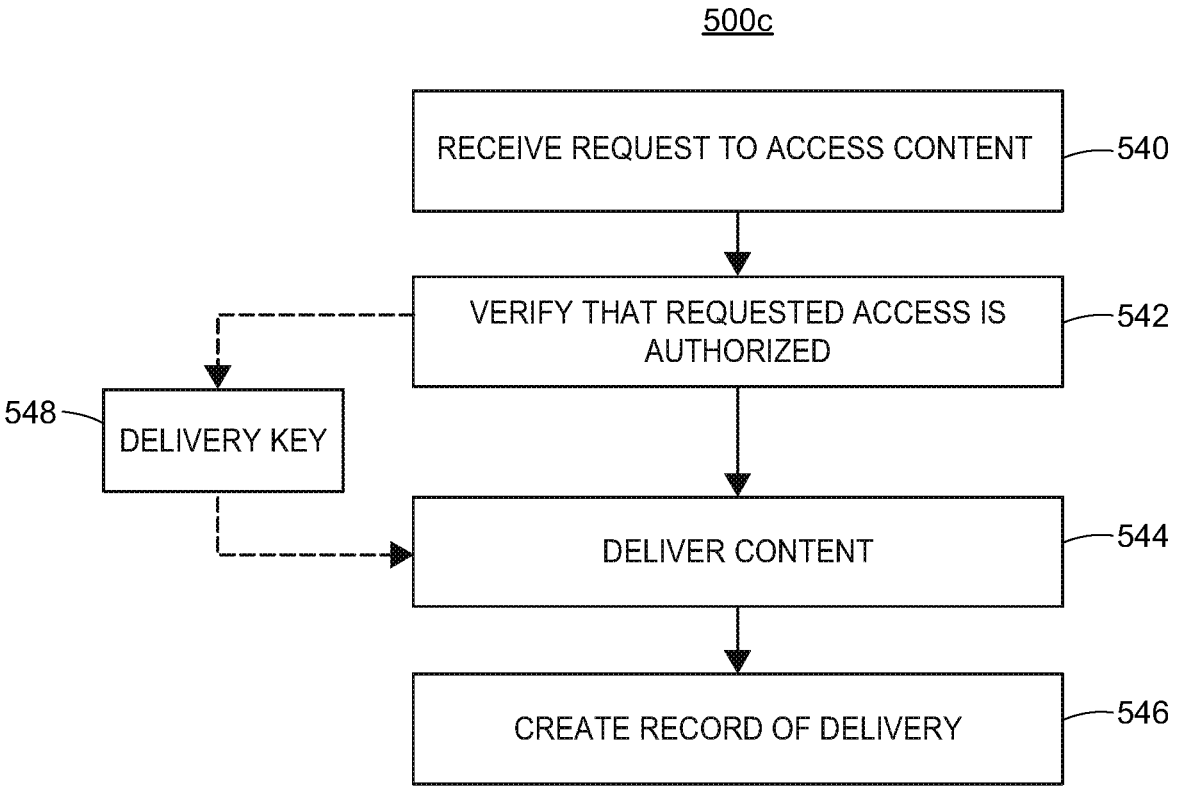

500c
RECEIVE REQUEST TO ACCESS CONTENT
540
VERIFY THAT REQUESTED ACCESS IS AUTHORIZED
542
548
DELIVERY KEY
DELIVER CONTENT
544
CREATE RECORD OF DELIVERY
546

FIG. 5C

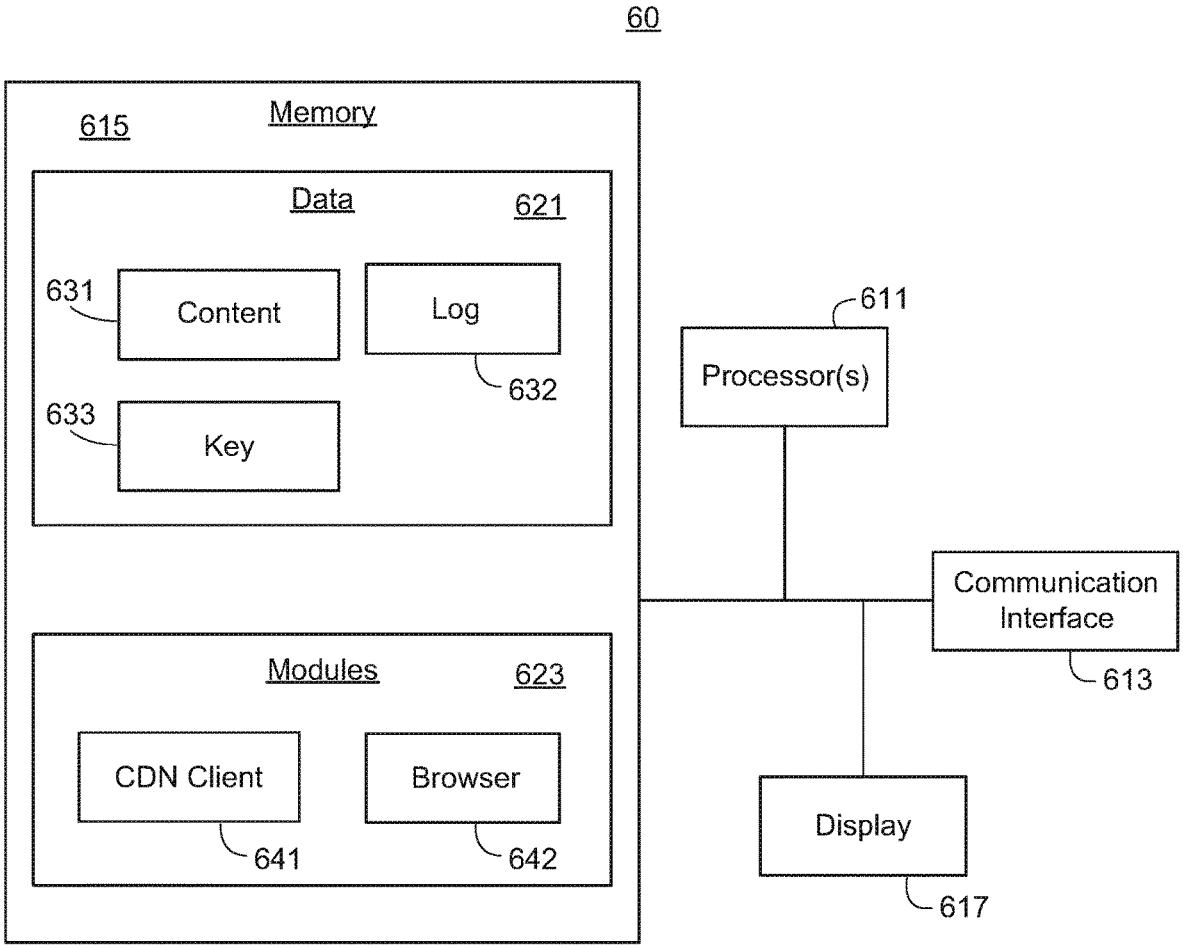

60
615
Memory
Data
621
631
Content
Log
632
633
Key
611
Processor(s)
Communication Interface
613
Modules
623
CDN Client
641
Browser
642
Display
617

FIG. 6

IN-VEHICLE CONTENT DELIVERY SYSTEM OPERABLE IN AUTONOMOUS MODE AND NON-AUTONOMOUS MODE

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application is a continuation of (i) U.S. application Ser. No. 16/257,972, filed Jan. 25, 2019 and titled "In-Vehicle Content Delivery System Operable in Autonomous Mode and Non-Autonomous Mode," which is a continuation of (ii) U.S. application Ser. No. 15/222,219, filed Jul. 28, 2016 and titled "In-Vehicle Content Delivery System Operable in Autonomous Mode and Non-Autonomous Mode," which is a continuation of (iii) U.S. application Ser. No. 14/530,409, filed Oct. 31, 2014 and titled "Autonomous-Mode Content Delivery and Key Management," which is related to (iv) U.S. patent application Ser. No. 14/530,423 titled "Resumption of Play for a Content-Delivery Session," filed Oct. 31, 2014, the contents of each of which are hereby incorporated by reference in their entirety.

TECHNICAL FIELD

[0002] The present disclosure generally relates to delivering multimedia content to consumer electronic devices, and, in particular, to a system that utilizes one or more content delivery systems to deliver the multimedia content.

BACKGROUND

[0003] Airline passengers typically have limited entertainment options when in-flight. As a result, passengers often utilize personal electronic devices when travelling. Personal electronic devices, however, have a number of limitations when relied on for in-flight entertainment. In particular, entertainment options often remain limited due to isolation from external networks such as the Internet. Even when connection to external networks is possible, network access can be expensive and download speeds can be frustratingly slow for passengers who often expect on-demand availability of high quality multimedia content. As a result, a passenger's content options are often limited to multimedia content he or she loaded to a personal device before the trip.

BRIEF SUMMARY OF THE DISCLOSURE

[0004] This summary is provided to introduce a selection of concepts in a simplified form that are further described below in the Detailed Description. This summary is not intended to identify key features or essential features of the claimed subject matter, nor is it intended to be used to limit the scope of the claimed subject matter.

[0005] The methods and systems disclosed herein may be used to securely deliver multimedia content to content consumer devices via one or more content-delivery systems ("CDSs") of a content-delivery network. The content consumer devices may decrypt encrypted content (using, e.g., one or more keys received from a CDS) and display the content via a display component. The content (and cryptography keys for decrypting the content) may be distributed to the CDSs from a data center.

[0006] In addition to delivering received content to end-users, each CDS is capable of implementing a key-management scheme to facilitate secure content-delivery and usage tracking, even when the CDS is disconnected from the data center that originally distributed the content and/or keys. Accordingly, the disclosed systems and methods facilitate the operation of CDSs which may operate in "autonomous mode" when disconnected from a larger content-delivery network, maintaining secure content-delivery capabilities despite having little if any connectivity to external networks.

[0007] One or more of the CDSs may be disposed at a vehicle. Accordingly, the methods and systems disclosed herein may be especially beneficial for providing content-delivery services to passengers of a vehicle or group of vehicles (e.g., for a fleet of airplanes where connectivity to external networks may be limited or inconsistent).

[0008] A system for providing an in-vehicle content-delivery service to a consumer device may comprise a data center including a license server configured to provide one or more keys, from a key-store, for decrypting encrypted content. The system may also include a first CDS disposed at a first vehicle. The first CDS may include one or more memory devices storing a content-distribution from the data center. The content-distribution may include a first set of keys from the key-store for decrypting a first collection of encrypted content. The first CDS may also include a first proxy license server configured to determine whether license-data, stored at a memory of the first CDS, authorizes delivery, of first content-data from the first collection of encrypted content, responsive to a content-request received at the first CDS. The content-request received at the first CDS may be transmitted from a consumer device communicatively coupled to the first CDS. When the license-data authorizes delivery of the first content-data, the CDS may transmit, for reception by the first consumer device, a key from the first set of keys for decrypting the first content-data.

[0009] A computer-implemented method for providing an in-vehicle content-delivery service to a consumer device may comprise receiving, at a first content-delivery system ("CDS") disposed at a first vehicle, a content-distribution including a first set of keys from a key-store managed by a license server. The first set of keys are generally keys capable of decrypting a first collection of encrypted content. The method may further include storing the content-distribution to a memory of the first CDS. Additionally, the method may include receiving, at the first CDS, a first content-request transmitted from a first consumer device communicatively coupled to the first CDS. The method may also include causing a processor of the first CDS to determine whether license-data stored at a memory of the first CDS authorizes delivery, of first content-data from the first collection of encrypted content, responsive to the first content-request. The method may further include transmitting, for reception by the first consumer device, via a communication interface of the first CDS, a key from the first set of keys for decrypting the first content-data (e.g., when the processor determines that the license-data authorizes the delivery of the first content-data).

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] FIG. **1**A illustrates an example CDN according to an embodiment.

[0011] FIG. **1**B illustrates an example CDN according to an embodiment.

[0012] FIG. **1**C illustrates an example method for managing and monitoring content-delivery by way of a CDN in accordance with the described embodiments.

[0013] FIG. **2**A illustrates an example CDS of a CDN according to an embodiment.

[0014] FIG. **2**B illustrates an example CDN according to an embodiment.

[0015] FIG. **2**C illustrates an example CDN according to an embodiment.

[0016] FIG. **2**D illustrates an example CDN according to an embodiment.

[0017] FIG. **2**E illustrates an example CDN according to an embodiment.

[0018] FIG. **3** illustrates an example vehicle according to an embodiment.

[0019] FIG. **4** illustrates an example CDS according to an embodiment.

[0020] FIG. **5**A illustrates an example method for loading content to a vehicle according to an embodiment.

[0021] FIG. **5**B illustrates an example method for managing access to content and licensing content according to an embodiment.

[0022] FIG. **5**C illustrates an example method for delivering content and tracking delivery according to an embodiment.

[0023] FIG. **6** illustrates an example content consumer device according to an embodiment.

DETAILED DESCRIPTION

[0024] In recent years, airlines have increasingly focused on improving in-flight entertainment options for passengers. As an example, some airlines now load (e.g., via a USB thumbdrive) movies to a hard-drive located on an airplane before a flight. The movies are then provided to passengers via screens and headphone jacks that have been installed on the airplane. For example, some airlines have installed screens on the back of seat head-rests. In these scenarios, passengers sometimes have the ability to choose between a number of pre-recorded television or movie "channels" that display content loaded to the airplane before the flight. Generally speaking, these systems offer a small number of content options from which the passenger can choose.

[0025] As another example, some airlines provide services (such as Wi-Fi or other data delivery services) to enable a consumer device on-board a vehicle to access external networks. To establish communications for services to such consumer devices, providers often utilize a wireless communication link such as a direct Air-to-Ground (ATG) link or a satellite link over which communications or data is delivered to and from the vehicle. Unfortunately, communication links to external networks are sometimes unavailable (e.g., when the vehicle travels to a location that is outside of network coverage), slow or busy (e.g., with a queue of pending upload requests), or malfunctioning, thus rendering the on-board data services unavailable to or unusable by the consumer devices. Accordingly, a passenger often has limited access to external networks, reducing the passenger's entertainment options while in-flight.

[0026] The disclosed systems and methods enable a passenger to access content via a consumer electronic device, even when disconnected from external networks.

1. Example Content-delivery Networks ("CDN")

[0027] 1.01 CDN **10***a*

[0028] FIG. **1**A illustrates an example CDN **10***a* according to an embodiment. The CDN **10***a* includes content-delivery systems (CDSs) **40** (described in more detail with reference to FIG. **4**), which are used to facilitate the management and monitoring of content-delivery to content consumers **60** (described in more detail with reference to FIG. **6**).

[0029] The CDS **40** may deliver content to one or more consumers **60** regardless of its connection to the network **112**. Typically, a CDS **40** and/or vehicle **30** are said to be operating in autonomous mode when not relying on external networks (e.g., network **112**) to provide content, or keys for decrypting content, that is delivered to the consumers **60**.

[0030] In an embodiment, the CDN **10***a* includes a plurality of vehicles **30**. Each of the vehicles **30** may be communicatively connected (directly or indirectly) to one or more external networks **112** (i.e. network external to the vehicles **30**). One or more of the vehicles **30** may have an on-board CDS **40**. In certain instances, the CDSs **40** receive content (and/or keys for decrypting the content) via a network **112**. Further, the CDSs **40** may report content-delivery via a network **112**. Each vehicle **30** may provide, via a CDS **40**, content to consumers **60** on-board (or proximate to) the respective vehicle **30**. Generally speaking, "content" refers to multimedia content, and may include audio and/or visual information. Typical examples of content include movies, television shows, songs, video games, or any other content involving audio and/or visual presentation. In other words, content may include anything that can be provided as output at a display component (e.g., a screen) and/or audio component (e.g., a speaker) of a consumer device.

[0031] In an embodiment, the CDSs **40** are not vehicle-based. For example, the CDSs **40** may be independent or disposed at another structure, such as a building. Generally speaking, the CDN **10***a* may be useful in any environment where content consumers **60** can establish connection to a particular CDS **40**, but are otherwise isolated (or likely to be isolated) from external networks **112** and other CDSs **40** of the CDN **10***a*. That is, the CDN **10***a* may be useful for providing content-delivery services to consumers in environments where network coverage (e.g., for connecting to the internet) is inconsistent or unreliable.

[0032] 1.02 CDN **10***b*

[0033] FIG. **1**B illustrates an example CDN **10***b* according to an embodiment. In operation, the CDN **10***b* facilitates managing and monitoring multimedia content-delivery to consumer devices at multiple vehicles (e.g., airplanes, ships, trains, buses, etc).

[0034] For example, the CDN **10***b* may be utilized to manage and/or monitor content-delivery to passengers across a fleet of airplanes. Managing and monitoring content-delivery in such an environment presents a number of challenges for traditional content-delivery systems. In particular, because airplanes often have inconsistent access to external networks while in flight (if they have access at all), traditional systems that heavily rely on consistent access to a central server for managing and/or monitoring content-delivery are generally ill-suited for such an environment. For example, traditional systems often rely on a central server to authenticate a user before content is provided to an end-user. As a result of this reliance, traditional systems often do not provide content when disconnected from the central server.

[0035] In contrast, the CDN **10***b* can manage and monitor content-delivery across a distributed network (e.g., across a fleet of airplanes capable of providing content to passengers) in which nodes that provide content to end-users (e.g., CDSs **40**) often lack connection to external networks **112** and other

nodes of the CDN **10***b*. The enhanced management and monitoring of content-delivery provided by the CDN **10***b* benefits a number of parties involved in the digital supply chain used to distribute multimedia content. For example, the CDN **10***b* enables content providers to structure more cost-effective licensing arrangements and to provide end-users with more content options than previously feasible.

[0036] The CDN **10***b* may include a network **112**, content-delivery systems ("CDS") **140***a-e*, vehicles **130***a*-e, and a data center **171** including a CDN monitor **175**.

[0037] 1.02(a) Network **112**

[0038] Generally speaking, the network **112** is a telecommunication network (or group of telecommunication networks) including (i) nodes and (ii) links used for data and/or communication exchange between various nodes. For example, one or more of the following may be nodes of the network **112** at various points in time, and may communicate when connected, directly or indirectly, with other nodes of the network **112**: the vehicles **130***a-e*, the CDSs **140***a-e*, the consumer devices **160***a-e*, the data center **171**, and the CDN monitor **175**. The network **112** may be disposed, managed, and/or hosted, for the most part (if not entirely), externally to the vehicles **130***a-e*. As such, the network **112** may sometimes be referred to as an "external network."

[0039] The external network **112** may be a combination of ground based and air-borne networks, such as an air-to-ground (ATG) communication network for aircraft use, or a mobile communication network for cellular or mobile phones and smart devices.

[0040] Further, the network **112** may include one or more public or private networks. For example, the network **112** may include a public "ground-based" network such as the Internet and/or the PSTN (Public Switched Telephone Network). Generally, phrases such as "ground network" and "ground computing device" refer to networks and computing devices that are not being transported by one of the vehicles **130***a-e*. Typical ground systems and ground computing devices may be essentially fixed in location, and may be contained in one or more buildings or structures fixedly attached to the ground.

[0041] In an embodiment, one or more of the vehicles **130***a-e* may be disconnected from the network **112** at a given time and thus may be unable to communicate with other nodes of the network **112** (e.g., the data center **171** or CDN monitor **175**) at that time. For example, the vehicles **130***a-e* may periodically enter and exit "dark zones," resulting in intermittent connection to the network **112**. To illustrate, the vehicle **130***a*, e.g., may lose connection to the network **112** when the vehicle **130***a* enters a "dark zone" (e.g., an area where the vehicle **130***a* cannot receive and/or transmit data to another node on the network **112**). In such instances, the vehicle **130***a* and/or the CDS **140***a* may be said to operate in "autonomous mode." In some embodiments one or more of the vehicle **130***a-e* may maintain essentially persistent connection to the network **112**, whether in-transit or not.

[0042] Regardless of frequency and length of connection, the vehicles **130***a-e* are generally configured to communicate via the network **112** (e.g., while in transit or while not in transit, such as when an airplane is in a hanger or at a terminal of an airport). In particular, the vehicles **130***a-e* may be communicatively connected to the network **112** via a CDS **140***a-e*. Alternatively or additionally, the vehicles **130***a-e* may include a communication system, independent from the CDSs **140***a-e*, for connection to the network **112**. Once connected, the vehicles **130***a-e* may communicate with other nodes of the network **112**, such as the data center **171**, CDN monitor **175**, or other of the vehicles **130***a-e*.

[0043] 1.02(b) Vehicle **130***a-e*, CDSs **140***a-e*, and Consumer Devices **160***a-e*

[0044] The vehicles **130***a-e* may be similar to the vehicle **30** shown in FIG. **3**; the CDSs **140***a-e* may be similar to the CDS **40** shown in FIG. **4**; and the consumer devices **160***a-e* may be similar to the consumer device **60** shown in FIG. **6**.

[0045] 1.02(c) Data Center **171**

[0046] The data center **171** (and the CDN monitor **175**) may be communicatively coupled to the network **112** via the antennas **151**, enabling communication between the data center **171** and one or more of the vehicles **130***a-e*, CDS **140***a-e*, and/or consumer devices **160***a-e*. As an example, the CDN monitor **175** may communicate with one or more of the vehicles **130***a-e* via the network **112**.

[0047] The data center **175** may include systems that enable a content provider to (i) provide content to the CDSs **140***a-e*, (ii) provide keys for decrypting the content, and/or (iii) monitor content-delivery performed throughout the CDN **10**B. Accordingly, the data center **171** may be communicatively connected to the CDSs **140***a-e* and various other systems by way of the antennas **151** and the network **112**.

[0048] In an embodiment, the data center **171** includes the CDN monitor **175**, which may be configured to monitor content distributed at each of the vehicles **130***a-e*. For example, the data center **171** may receive, via the network **112**, a report of content delivery performed at the vehicle **130***a*. Based on the received report, the content delivery monitor **175** may update a log to include a record of the content delivery. The log may be similarly updated based on reports received from vehicles **130***b*-**130***e*. Accordingly, the data center **171** may maintain a system-wide record of content delivery to consumer devices **160***a-e* at multiple vehicles **130***a-e*.

[0049] 1.02(d) Example Operation of the CDN **10***b*

[0050] In operation, the CDN **10***b* may manage and/or monitor content-delivery to one or more of the consumer devices **160***a-e* at the vehicles **130***a-e*. In particular, multimedia content may be distributed to the vehicles **130***a-e* (e.g., by a system at the data center **171**, or by a source device **399** shown in FIG. **3**). The vehicles **130***a-e* may receive the multimedia content by way of the network **112**, or by way of a direct connection to a source device **399**. The vehicles **130***a-e* may deliver the content to consumer devices **160***a-e* and report the content-delivery by way of the network **112**. Accordingly, the CDN **10***b* allows content providers to (i) deliver multimedia content to one or more consumer devices **160***a-e*, (ii) monitor the delivery of multimedia content to the consumer devices **160***a-e*, and/or (iii) log content-delivery performed by the CDN **10***b*.

[0051] In an embodiment, keys (e.g., DRM keys) are generated at the data center **171**. The keys are then distributed to each of the vehicles **130***a-e* (e.g., when the vehicles are docked or stationed). In an embodiment, the keys may be stored at an SQL database. An InnoDB storage engine may be used for database transactions. As an example, an InnoDB storage engine may be used to commit or make certain database changes permanent, and/or to rollback or cancel certain database transactions. The database(s) at the data center **171** may include assets, asset keys, and policies.

The database(s) may also include device keys and models, as well as portals and digital copy protection hashes.

[0052] In an embodiment, a CDN monitor **175** monitors content usage across the CDN **10***b* by tracking content-delivery performed by each of the CDSs **140**. In an embodiment, the CDN monitor **175** collects access logs from each of the CDSs **140** reflecting content-delivery performed by the CDS **140** that maintained the access log. The CDSs **140** may transmit reports (e.g., on a periodic basis) generated based on an access log. The CDN monitor **175** may receive the reports and update a CDN log, based on the received reports, to track content-delivery performed at the vehicles **130**. Some embodiments do not include a CDN monitor **175**.

[0053] In some embodiments, the data center **171** includes a license server. In some instances, the license server tracks device models (e.g., phone models, tablet models, laptop computer models, etc.) The license server may rely on device model information to accept or reject a license request. Content may be encrypted against the license server, and keys (e.g., DRM keys) may be generated at the license server.

[0054] 1.03 Example Method **180**

[0055] FIG. **1**C illustrates an example method **180** for managing and monitoring content delivery by way of a CDN in accordance with the described embodiments. The method **180** may be implemented, in whole or in part, by the CDN **10***a* (shown in FIG. **1**A) or **10***b* (shown in FIG. **1**B). The method **180** may be saved as a set of instructions, routines, programs, or modules at computer readable media found, for example, in memory devices at vehicles **130***a-e*, the CDSs **140***a-e*, and/or the data center **171** of the CDN **10***b* shown in FIG. **1**B. While the method **180** is described with reference to the CDN **10***b*, method **180** may be implemented by other embodiments of the CDN not depicted in FIG. **1**B.

[0056] Generally speaking, the CDN **10***b* may implement the method **180** to (i) deliver multimedia content to one or more consumer devices **160***a-e* using one or more CDSs **140***a-e*, (ii) monitor the delivery of multimedia content performed at the one or more CDSs **140***a-e*, and/or (iii) log content delivery performed by the one or more CDSs **140***a-e* in the CDN **10***b*.

[0057] The method **180** begins when multimedia content is distributed from the data center **171** to one of the vehicles **130***a-e* (block **182**). In an embodiment, the content may be distributed via the one or more antennas **151** and the network **112**. In an embodiment, the content may be distributed via electronic devices such as the source device **399** shown in FIG. **3**. The following example focuses on vehicle **130***a*, CDS **140***a*, and consumer devices **160***a* for the sake of clarity, but similar operation may occur at the vehicles **130***b-e*, CDSs **140***b-e*, and consumer devices **160***b-e*.

[0058] The vehicle **130***a* receives the distributed content and may store the content at a memory device at the vehicle **130***a*.

[0059] The CDS **140***a* may establish a delivery sessions with one or more consumer devices **160***a* (block **184**), during which the CDS **140***a* accesses the received content and distributes the content to appropriate consumer devices **160***a* (block **186**). The CDS **140***a* may also distribute licenses or keys to the consumers **160***a* so that the consumers **160***a* can decrypt the content and provide the content to an end-user. Accordingly, the content can be securely delivered from the CDS **140***a* to the consumers **160***a*. Importantly, the CDN **10***b* enables passengers at the vehicle **130***a*, for example, to consume content via consumer devices **160***a* while in transit.

[0060] To track content delivery, the CDS **140***a* may generate or update a local record (e.g., at a memory device accessible at the vehicle **130***a*) of the content delivery performed by the CDS **140***a* (block **188**). Each of the CDSs **140***b*-**130***e* may similarly generate or update local records of content delivery.

[0061] To facilitate logging content delivery, the CDS **140***a* may report content delivery performed by the CDS **140***a* (block **190**). In particular, the CDS **140***a* may transmit a "report" via the network **112**. The report may be data or information relating to content delivery performed by the CDS **140***a*, and may be generated based on the aforementioned local record of tracked content delivery. For example, the report may include information identifying delivery sessions, users, consumer devices **160***a-e*, and/or particular piece(s) of content (e.g., a movie or song title, or unique identifier) that have been delivered.

[0062] With further reference to logging content delivery, the report transmitted by the CDS **140***a* may be received at the data center **171** (and in particular, at the CDN monitor **175**) to be logged (block **192**). The CDN monitor **175** may update a system-wide log to include a record of the content delivery associated with the report. Similar reports from any of the other vehicles **130***a-e* (e.g., transmitted by one of the CDSs **140***a-e*) may be received at the data center **171**. Accordingly, the data center **171** may include a log of content delivered to one or more consumer devices **160***a-e*. In an embodiment, the log is a record of utilized keys. Consequently, CDN **10***b* may utilize the data center **171** to monitor content delivery performed at any and all of the vehicles **130***a-e*.

2. Example Content-Delivery Networks and CDSs

[0063] FIG. **2**A-**2**E illustrate example CDSs and example content-delivery networks.

[0064] 2.01 CDN **20***a*

[0065] FIG. **2**A illustrates an example CDS **240***a* of a CDN **20***a* according to an embodiment. In operation, a consumer device **260** transmits data representing a request for content (including, e.g., an identifier corresponding to a particular content title stored at the **240***a*). In response, the CDS **240***a* transmits the requested content (in whole or in part), in addition to a key for accessing content (e.g., a DRM key), to the consumer device **260**. An example CDS, example content, and example key(s) are described in further detail with reference to FIG. **4**. An example consumer is described in further detail with reference to FIG. **6**.

[0066] 2.02 CDN **20***b*

[0067] FIG. **2**B illustrates an example CDN **20***b* according to an embodiment. The CDN **20***b* may include a packager **241**, a CDS **240***b*, and one or more consumer devices **260**. The CDS **240***b* includes a licensing server ("licensor") **242** and a distribution server ("distributor") **243**.

[0068] 2.02(a) Packager **241**

[0069] In example operation, the packager **241** (i) transmits protected content to the distributor **243** (where it may be stored as protected content **252**) and (ii) transmits encryption information to the licensor **242**. The distributor **243** may subsequently distribute the protected content **252** to one or more consumers **260**, and the licensor **242** may transmit the

encryption information (e.g., a key) to the consumer device **260** so that the consumer device **260** can access the protected content (e.g., for playback).

[0070] The packager **241** may utilize asymmetric or symmetric cryptography techniques protect the content. For symmetric cryptography, a single key is used to both encrypt and decrypt content. For example, the packager **241** may encrypt content utilizing a particular key. The encrypted content may subsequently be transmitted to the consumer device **260** (e.g., via the distributor **243**), where the consumer device **260** utilizes the same key to decrypt the encrypted content. In such an example, the CDS **240***b* may transmit the key to the consumer device **60** (e.g., via the licensor **242**).

[0071] For asymmetric cryptography, two or more distinct keys may be used. In an embodiment, the CDN **20***b* may utilize public-key encryption techniques. For example, the packager **241** may utilize a first key to encrypt content and the consumer device **260** may utilize a second key to decrypt the content. The first key (which may be referred to, e.g., as an "encryption key" and/or a "public key" in some instances) may be linked (e.g., mathematically) to the second key (which may be referred to, e.g., as a "decryption key" and/or "private key" in some instances). The first key may be generated so that anything encrypted with the first key may only be decrypted with the second key.

[0072] The packager **241** may receive or otherwise access unencrypted content **251**. The packager **241** may encrypt the unencrypted content **251** to produce protected (i.e., encrypted) content, which is then transmitted to the distributor **243**. The packager **241** may generate an encryption key. In some embodiments, a key generator independent of the packager **241** generates such a key. In any event, the encryption key may be transmitted to the licensor **242** (e.g., by the packager **241**).

[0073] In an embodiment, the packager **241** does not transmit an encryption key to the CDS **240***b*. In such an embodiment, the packager **241** may utilize a "shared secret" with the licensor **242** and/or consumer device **260**. The shared secret may be a decryption key and/or a key-agreement protocol. The key agreement protocol may enable the licensor **242** and/or consumer device **260** to generate a decryption key.

[0074] 2.02(b) Licensor **242**

[0075] The licensor **242** is a computing system configured to authorize or refuse content-access for a consumer device **260**. In particular, the licensor **242** may receive a request from the consumer device **260**, and may issue a license or key to the consumer device **260** when appropriate (such as when a payment has been processed for the content at issue). In an embodiment, the licensor **242** may also be configured to monitor content usage by the consumer device **260**. The licensor **242** may execute one or more modules to provide the functionality described herein, and may sometimes be referred to as a "license server."

[0076] The licensor **242** may include a memory device storing software modules, including a payment processor **206** and/or a usage monitor **208**. The payment processor **206** handles financial transactions with the consumer device **260**, and the usage monitor **208** monitors content accessed by one or more consumers **260**. The usage monitor **208** may generate or update a usage log, such as the usage log **435** illustrated in FIG. **4**, based on monitored content access. In an embodiment, the payment processor **206** and/or the usage monitor **208** may be modules or systems independent of the licensor **242**. In such an embodiment, the licensor **242** may communicate via a network to invoke the payment processor **206** or the usage monitor **208**.

[0077] In an embodiment, the licensor **242** may access license-data **254** stored at a memory device. The license-data **254** may include data representing one or more of: identities (e.g., corresponding to particular users and/or particular content consumer devices), a usage log to track content consumed by one or more consumers **260**, cryptography keys, and/or records of access rights for one or more consumers **260**. License-data is described in further detail with reference to FIG. **4**.

[0078] In example operation, the licensor **242** may receive encryption information from the packager **241**. The licensor **242** may store the encryption information, and may associate the encryption information with particular protected content **252**. For example, licensor **242** may store a content item, or some other reference information associated with protected content **252**, as being associated with the encryption information. Further, the licensor **242** may receive an access request from a consumer device **260**. The licensor **242** may analyze the license data **254** to determine whether the requesting consumer device **260** is authorized to access protected content **252**. If the license data **254** indicates that the consumer device **260** is authorized to access the license data **254**, the licensor **242** may transmit a key to the consumer device **260** so that the consumer device **260** can decrypt some or all of the license data **254**. In some instances, the licensor **242** may also transmit a license record to the consumer device **260**. The license record may include information pertaining to the particular access rights that have been granted to the consumer device **260** or the user of the consumer device **260** (e.g., specifying certain content, time limits, download limits, etc.)

[0079] Accordingly, the licensor **242** may (i) receive an access request or license request from the consumer **260** for protected content **252**, (ii) generate a license associated with the protected content **252**, and/or (iii) transmit encryption information (e.g., a decryption key or keys) to the consumer **260** for the protected content **252**. Generating the license may include updating the license-data **254** to include a record of new access rights granted to the consumer **260**. In an embodiment, the licensor **242** calls the payment processor **206** after receiving a request, and transmits the encryption information after the payment processor **206** facilitates a successful purchase by the consumer **260** for the protected content **252**. An example licensor and example access rights are described in more detail with reference to FIG. **4**.

[0080] The licensor **242** may call the usage monitor **208** to track content consumed or accessed by the consumer **260**. In an embodiment, the usage monitor **208** tracks content as it is delivered by the licensor **242**. In an embodiment, the usage monitor **208** "audits" the consumer device **260**. For example, the usage monitor **208** may cause the licensor **242** to transmit an audit request to the consumer device **260**. In response, the consumer device **260** may transmit data from a local log to the licensor **242**.

[0081] 2.02(c) Distributor **243**

[0082] The distributor **243** may include a content server **202** and/or a consumer portal **204**, and may access protected content **252** and/or content metadata **253** stored at one or more memory devices.

[0083] In example operation, the distributor **243** receives the content metadata **252**, directly or indirectly, from the packager **241** (e.g., via a communication interface) and stores the protected content **252** to memory. The distributor **243** may receive content metadata **253** included with or accompanying the protected content **252**. Generally speaking, the content metadata **253** includes data describing the protected content **252**. For example, for a particular file in the protected content **252** (e.g., a video file), the content metadata **253** may identify a title, file path, file type, file size, codec, or other information about the file.

[0084] The content server **202** transmits protected content **252** to the consumer device **260**. The consumer portal **204** is a service or module that provides an interface, via a network, to the consumer device **260**, enabling the consumer device **260** to select content and/or purchase content. An example portal is described in more detail with reference to FIG. **4**.

[0085] In an embodiment, a content-loader device receives the protected content **252** (directly or indirectly) from the packager **241**, and stores the protected content **252** at a memory device accessible to the distributor **243**. An example content-loader is described in further detail with reference to FIG. **4**.

[0086] 2.03 CDN **20***c*

[0087] FIG. **2**C illustrates an example CDN **20***c* according to an embodiment. The CDN **20***c* may be referred to as a CDN with a centralized CDS. The CDN **20***c* includes a CDS **240***c*, a vehicle **230***a*, a vehicle **230***b*, and a vehicle **230***c*. Each of the vehicle **230***a-c* includes (i) corresponding electronics system **231***a-c*, and (ii) corresponding consumer device(s) **260***a-c*. In example operation, the CDS **240***c* handles content requests from each of the vehicles **230***a-c*, and may deliver content to each of the vehicles **230***a-e* (e.g., via the network **212** and the electronics systems **231***a-c* of the vehicles).

[0088] In some instances, one of the vehicles **230***a-c* may be disconnected from the network **212***c*. As illustrated, vehicle **230***c* is disconnected. In this state, the consumer device(s) **260***c* cannot communicate with the CDS **240***c*, and thus cannot request or receive content until reconnected to the network **212**. Further, while in this state the vehicle **230***c* and/or the CDS **240***c* may be said to be operating in "autonomous mode." When in autonomous mode, a consumer device(s) **260***c* will generally be limited to consuming content that has already been downloaded to the consumer device(s) **260***c*. In other words, the vehicle **230***c* may provide no other mechanism for delivering content to the consumer device(s) **260***c*.

[0089] In some instances, when in autonomous mode the consumer device(s) **260***c* may even be limited from consuming content already downloaded. For example, in some embodiments the consumer device(s) **260***c* may include a client that will only play downloaded content upon receiving authorization from the CDS **240***c* (or from another system connected to the network **212**). If authorization is required from an external license server, for example, the consumer device(s) **260***c* may not be able to provide some content to end-users while the CDS **240***c* is in autonomous mode.

[0090] 2.04 CDN **20***d*

[0091] FIG. **2**D illustrates an example CDN **20***d* according to an embodiment. The CDN **20***d* may be referred to as a CDN with a distributed CDS. The CDN **20***d* includes multiple CDSs **240***d-f* (similar to the CDS **40** shown in FIG. **4**), a packager **241**, and a CDN monitor **275**; each of which may communicate via a network **212***d* (similar to network **112** shown in FIG. **1**) with one or more other nodes connected to the network **212***d*. The CDSs **240***d-f* include licensors **242***d-f* and distributors **243***d-f* (e.g., which may be similar to the licensor **242** and distributor **243** shown in FIG. **2**B).

[0092] The packager **241** may be located at the data center **171** shown in FIG. **1**. In example operation, the packager **241** protects content-data (e.g., via encryption) that is to be distributed to the CDSs **240***d-f*. In an embodiment, the packager **241** transmits the protected content-data to the CDSs **240***d-f* via the network **212***d*.

[0093] In some instances, the packager **241** is not connected to the network **212***d*. For example, the protected content may be loaded to an uploading device to distribute the protected content to one or more of the vehicles **230***d-f*. An example uploading device (referred to as a source device **399**) is described with reference to FIG. **3**. The uploading device may load the protected content to the appropriate vehicle **230***d-f* (e.g., via the source device **399** shown in FIG. **3**).

[0094] Typically, the CDSs **240***d-f* are installed or otherwise disposed at vehicles **230***d-f*. In particular, the CDSs **240***d-f* may be part of the communications systems or electronics systems **231***d-f* of the vehicles **230***d-f*. In example operation, each of the CDSs **240***d-f* may receive content from a content-loader and/or from the data center **171** shown in FIG. **1**, and may provide the content to consumer device(s) **260***d-f*. Accordingly, the CDN **20***d* enables passengers on-board or proximate to the vehicles **230***d-f* to consume content (e.g., while in transit) by establishing communication with the electronics system **231***d-f* of the vehicle **230***d-f*.

[0095] In the illustrated embodiment, vehicle **230***f* is disconnected from the network **212***d*. Despite being disconnected from the network **212***d*, the vehicle **230***f* may distribute content to the consumer device(s) **260***f*. Because the CDS **240***f* is disposed at the vehicle **230***f*, the consumer device(s) **260***f* can receive content even when the vehicle **230***f* is disconnected from external networks. While the content selection may be limited to content previously loaded to the vehicle **230***f* (e.g., content loaded via a content-loader device and/or via the network **212***d*) when in a disconnected state, the consumer device(s) **260***f* may maintain access to a content library on-board the vehicle **230***f* via the CDS **240***f*.

[0096] The CDN monitor **275** may be located at the data center **171** shown in FIG. **1**. In example operation, the CDN monitor **275** receives records or reports from the vehicles **230***d*-**230***f* regarding content-delivery performed at each of the vehicles. Example embodiments and operation of a CDN monitor are discussed in further detail with reference to FIG. **1**B.

[0097] 2.05 CDN **20***e*

[0098] FIG. **2**E illustrates an example CDN **20***e* according to an embodiment. The CDN **20***e* includes a network **212***e* (similar to the network **112** shown in FIG. **1**) and vehicles **230***g-i* (similar to the vehicle **30** shown in FIG. **3**). The CDN **20***e* also includes a packager **241**, licensor **242***j* (similar in certain respects to the licensor **242** shown in FIG. **2**B), and a CDN monitor **275**, one or more of which may be disposed at the data center **171** shown in FIG. **1**, and one or more of which may be communicatively connected to the network **212***e* at various times. An example packager and licensor are

described in more detail with reference to FIG. **2**B. The CDN **20***e* further includes CDSs **240***g-i* (similar to the CDS **40** shown in FIG. **4**).

[0099] The licensor **242***j* may access license-data stored at a memory device (example license-data is described in more detail with reference to FIG. **2**B). In particular, the licensor **242***j* may manage a key-store including keys that are distributed to each of the vehicles **230***g-i*. Each of the CDSs **240***g-i* at the vehicles may locally manage the set of keys received from the licensor **242***j*. For example, each of the CDSs **240***g-i* may handle authorization verification operations with respect to consumers requesting content access. If one of the CDSs **240***g-i* determines that a particular consumer is authorized to access requested content, the CDS may transmit an appropriate key (from the set of keys received from the licensor **242***j*) so that the consumer can decrypt content (which is generally also provided by the CDS) and provide the content (e.g., via a display and/or speakers).

[0100] Each of the vehicles **230***g-i* includes communication systems **231***g-i* and consumers **260***g-i*. Example electronics and communication systems are described in further detail with reference to FIG. **3**. Each of the communications system **231***g-i* includes a corresponding CDS **240***g-i*.

[0101] Each CDS **240***g-i* includes a proxy licensor **242***g-i* (similar in certain respects to the licensor **242** shown in FIG. **2**B) and a distributor **243***g-i* (similar to the distributor **243** shown in FIG. **2**B). Each proxy licensor **242***g-i* may act as an intermediary between the licensor **242***j* and the respective consumers **260***g-i* to which the proxy licensor **242***g-i* is connected. In an embodiment, the proxy licensors **242***g-i* may operate in place of the licensor **242***j*, for example, when the CDS **240***i* and/or the vehicle **230***i* is disconnected from the network **212***e* (which may occur, e.g., when the vehicle **230***i* is operating in autonomous mode). In other words, the proxy licensors **242***g-i* may provide, to the content consumers **260***g-i*, keys for accessing content, even when operating in autonomous mode. Further, when the **240***f* establishes or reestablishes connection to the licensor **242***j* via the network **212***e*, the licensor **242***j* may load keys to the vehicle **230***i* and/or may monitor key usage at the vehicle **230***i*.

[0102] In short, the proxy licensor **242***i* may receive access requests, verify authorization for requested access to content, handle payment processing (e.g., by invoking the payment processor **206** shown in FIG. **2**B), transmit licenses or decryption keys to the requesting consumer device **260***i* so that the consumer device **260***i* can decrypt and display protected content, and/or synchronize with the licensor **242***j* when communication is possible.

[0103] In example operation, content-data may be loaded to the vehicle **230***i*. The licensor **242***j* may transfer (directly or indirectly) license-data, associated with the content-data, to the proxy licensor **242***i*. The proxy licensor **242***i* may manage access rights for the loaded content-data on-board the vehicle **230***i*, and may issue keys and/or licenses to the appropriate content consumers **260***g-i*. The issued keys are typically keys selected from a set of keys received (directly or indirectly) from the licensor **242***j*. Importantly, the proxy licensor **242***g-i* does not require connection to the licensor **242***j* in order to issue keys. Accordingly, the proxy licensors **242***g-i* enable content consumers **260***g-i* to receive licenses and/or keys, even when disconnected from the licensor **242***j*, for decrypting and displaying protected content.

[0104] In some instances, the proxy licensor **242***i* may be synchronized to the licensor **242***j* when connection to the licensor **242***j* has been reestablished (e.g., via the network **212***e*). Such synchronization may include transmitting (e.g., via a communication interface of the CDS **240***i* and/or via some other communication system **231***i* of the vehicle **230***i*) payment information from the proxy licensor **242***i* to the licensor **242***j*. In certain instances, the licensor **242***j* may verify the legitimacy of the payment information.

[0105] For example, payments often cannot be processed while the vehicle **230***i* operates in autonomous mode, because payments typically require interaction with third party systems that require broader network access (e.g., internet access). Accordingly, the proxy licensor **242***i* may collect payment information from consumers **260***i*, which is later transmitted to the licensor **242***j* so that the licensor **242***j* can process the payment. In some instances, the licensor **242***j* may be unsuccessful in processing such payment information (e.g., a credit card may be expired or overdrawn). In such instances, the licensor **242***j* may transmit a signal to the proxy licensor **242***i* indicating that the payment verification failed. In such a scenario, the CDS **240***i* may stop transmitting content to the appropriate consumer device **260***i* in response to receiving the signal.

[0106] Depending on the embodiment, the licensor **242***j* may establish a wired or wireless connection to the network **212***e* during the synchronization process. Further, such a connection may be established while in-flight (e.g., via an air-to-ground connection or an air-to-satellite connection) or while not in-flight (e.g., while stationed). For example, a communication link may be established when the vehicle is stationed at a port (e.g., airport) that includes networking equipment (e.g., a router) for a wired or wireless communication. In other instances, synchronization may occur without connection via the network **212***e*. For example, an intermediary device (e.g., a USB device) may be utilized to "unload" synchronization information from the vehicle **230***i* and to load the synchronization information to the licensor **242***j*. Such synchronization information may include payment information as previously mentioned, as well as various reports or journals that identify used keys, used key counts, or any other record of content-delivery that occurred while the vehicle **230***i* operated in autonomous mode.

[0107] In sum, the CDN **20***e* enables both (i) centralized key-management and content usage tracking, and (ii) distributed key-management and content-usage tracking. In short, the CDN CDN **20***e* includes a collection of CDSs that can each not only independently deliver content to content consumers, but can independently and securely control and manage content access. That is, the CDSs of the CDN **20***e* can implement secure, protected content-delivery without connection to a centralized license server or DRM system. By delivering content without relying on a central server (e.g., while in autonomous mode), the CDN **20***e* enables content-providers to deliver content to consumer devices without interruption of service, e.g., when access to the network **212***e* is lost. Further, by synchronizing the CDSs with the licensor **242***j* (e.g., when access to the network **212***e* is reestablished), the CDN **20***e* enables centralized key-management and content usage tracking.

3. An Example Vehicle **30**

[0108] FIG. **3** illustrates an example vehicle **30** according to an embodiment. In example operation, the vehicle **30** may

receive content from a source device **399** via the network **112** or via a direct connection to the source device **399**. The vehicle **30** may provide the received content to passengers on-board or proximate to the vehicle **30** (e.g., while in transit).

[0109] 3.01 Vehicle **30** Overview

[0110] Generally speaking, the vehicle **30** is a machine capable of conveying cargo or passengers from one location to another. The vehicle **30** may be used to transport passengers who pay for, or are otherwise granted, passage on the vehicle **30**. The owner or operator of the vehicle **30** may be an individual or some other entity, such as a business entity or governmental entity. In some embodiments, the vehicle **30** may be one of a fleet of vehicles and/or may be used to transport live or inanimate cargo, packages, mail, and/or other types of passengers or cargo.

[0111] In an embodiment, the vehicle **30** may be an aircraft. The vehicle **30** may be configured for travel by land, sea, air, or some combination thereof. For example, in some embodiments the vehicle **30** may be similar to one or more of the vehicles **130***a-e* illustrated in FIG. **1**. To illustrate, the vehicle **30** may be an aircraft, a bus, a train, or a watercraft. Regardless of the exact mode of transportation provided by the vehicle **30**, the vehicle **30** may generally be used and/or configured for content delivery purposes.

[0112] In particular, the vehicle **30** may be owned or operated by a content provider (e.g., a content owner), or by an entity that has contracted with a content provider to give the vehicle **30** content delivery capabilities. For example, the vehicle **30** may be a commercial passenger airplane owned or leased by an airline company, and the airline company may be a content provider (e.g., the airline may license content and provide the content to the passengers). With further reference to the previous example, the airline may not be a content provider, but may cooperate with a content provider that provides equipment, services, licenses, and/or content to facilitate content delivery to passengers on airplanes operated by the airline. While this example described aircraft, the vehicle **30** may be any type of vehicle, depending on the embodiment. Regardless of the precise design of the vehicle **30**, the vehicle **30** may be communicatively connected to one or more networks **112** (described in detail with reference to FIG. **1**). Further, the vehicle **30** includes systems or devices that enable the vehicle **30** to provide multimedia content to passengers.

[0113] 3.01(a) Electronics Systems **301**

[0114] The vehicle **30** may include electronic systems or devices **301**, one or more of which may communicate via an in-vehicle network **312**. One or more of the electronics systems **301** may be communicatively connected to other of the electronics systems **301**. Similarly, one or more of the electronics system **301** may be communicatively connected to systems or devices that are coupled to the networks **112**.

[0115] The electronics systems **301** may include traditional avionics systems (or equivalents for non-aircraft vehicles), such as communication systems, navigation systems, instrumentation, flight-control systems, or collision avoidance systems. The electronics system **301** may also include non-avionics systems (e.g., electronics not specifically designed for use in an aircraft). In an embodiment, the electronics systems **301** includes a control system **314**, a data distribution device **316**, an antenna **318**, a CDS **340** (each of which may be communicatively connected to the network **112**), and consumer devices **360***a-d*.

[0116] As many of the electronics systems **301** may require a degree of stability or secure attachment during transportation, at least some of the electronics systems **301** may be included in a line-replaceable-unit (LRU) that is fixedly or rigidly attached to the vehicle **30**. Typically, an LRU is an electronic assembly that performs a specific function in the vehicle **30** and may be removed or replaced as a unit and serviced at a vehicle maintenance center. For example, in an embodiment, the control system **314**, the data distribution device **316**, an antenna **318**, and/or the CDS **340** may be provided in respective LRUs. Of course, other types of devices transported by the vehicle **30** may be provided in respective LRUs.

[0117] Some of the electronics systems **301** may not be included in LRUs. For example, instead of being fixedly connected to the vehicle **30** via LRUs, some electronics systems **301** may be fixedly connected to the vehicle **30** using some other means, such as a bracket or other connecting device. Further, some electronics systems **301** may not be fixedly or rigidly attached to the vehicle **30** at all. For example, consumer devices (e.g., tablet, laptop, cell phone, smart device, etc.) of passengers or crew members on the vehicle **30** may not be fixedly or rigidly attached to the vehicle **30**.

[0118] 3.01(b) In-Vehicle Network(s) **312**

[0119] Generally speaking, the in-vehicle network **312** is a telecommunication network or group of networks disposed, managed, and/or hosted on-board the vehicle **30**. The in-vehicle network **312** may include various nodes and links used for data and/or communication exchange between the nodes. In an embodiment, nodes of the in-vehicle network **312** may also communicate with nodes outside of the in-vehicle network **312** (via, e.g., the network **112**). The in-vehicle network **312** may include one or more of: a wired network, a wireless network, or a network that uses a combination of wired and wireless technology. Further, the in-vehicle network **312** may include a public or a private network.

[0120] In an embodiment, the in-vehicle network **312** includes one or more access points that allow some or all of the electronics systems **301** to connect to the in-vehicle network **312**. For example, the in-vehicle network **312** may include networking equipment such as routers, hubs, switches, repeaters, bridges, and/or gateway devices. Some of the networking equipment may utilize a spread spectrum paradigm and/or one or more RF bands (e.g., an ISM band, such as the 900 MHz band, 2.4 GHz band or 5 GHz band) to facilitate communication. As another example, the networking equipment may include a power control segment to regulate power output from devices such as the consumer devices **360***a-e*.

[0121] The in-vehicle network **312** may include a personal area network (PAN) and/or a local area network (LAN), either of which may be wired or wireless in nature. For example, the in-vehicle network **312** may include a wireless LAN such as a Wi-Fi network. As another example, the in-vehicle network **312** may include an ARINC (Aeronautical Radio, Incorporated) **429** network for routing and delivering avionics data. Other examples of in-vehicle network **312** may include a wired Ethernet network (e.g., which may be used for delivering maps and other cockpit data).

[0122] The in-vehicle network **312** may utilize any known communication protocol or combinations thereof, such as a wireless protocol, a wired protocol, other ARINC standard-

compatible protocols, or a private protocol. In an embodiment, various nodes transported by the vehicle **30** and various nodes external to the vehicle **30** may discover one another, and may publish services and subscribe to services, using the in-vehicle network **312** and/or the network **112**.

[0123] 3.01(c) Control System **314**

[0124] The control system **314** may collect information from various sensors and/or instruments (e.g., for position sensing, force measurement, and/or pressure sensing). The control system **314** may then provide collected information (e.g., altitude, airspeed, aircraft position, or other flight state information) to nodes of the in-vehicle network **312** or network **112**. In an embodiment, various nodes of the network **112** (e.g., at the data center **171**) may receive the collected information. In an embodiment, one or more components of the flight control system **314** may be included in an LRU. Such an LRU may be responsible for collecting information from the various flight sensors and/or instruments.

[0125] 3.01(d) Data Distribution Device **316** & Antennas **318**

[0126] Generally speaking, the data distribution device **316** is a computing device that functions as an interface between the in-vehicle network **312** and networks external to the vehicle **30**, such as the network **112**. Accordingly, the data distribution device **316** may enable nodes of the in-vehicle network **312** (e.g., a consumer device **360**) to communicate with nodes of the network **112** (e.g., the data center **171**). The data distribution device **316** may be communicatively coupled to one or more antennas **318**.

[0127] The antennas **318** may enable air-to-air communication with other vehicles (e.g., any of the vehicles **130***a-e* shown in FIG. **1**). Alternatively or additionally, one or more of the antennas **318** may enable air-to-ground communication. The antennas may enable communication via a cell site or via a satellite communication system. A cell site is a location where antennas and electronic communications equipment are placed to create a cell in a cellular network. In an embodiment, the antenna **318** enables communication via the network **112**.

[0128] The data distribution device **316** may include interfaces that enable data exchange with devices and systems external to the vehicle. In an embodiment, the interfaces of the data distribution device **316** may be fixedly coupled to the vehicle **30**, and/or may be included in one or more Line-Replaceable Units (LRUs). In some embodiments, the data distribution device **316** itself may be a single LRU or multiple LRUs.

[0129] 3.01(e) CDS **340**

[0130] The CDS **340** may be similar to the CDS **40** shown in FIG. **4**. The CDS **340** may receive content (e.g., from the content-loader **380** or from the data center **171** shown in FIG. **1**) and store content at a memory device on-board the vehicle **30**. The content may be loaded to the vehicle **30** via wireless communication links or via wired communication links, depending on the embodiment.

[0131] The content stored at the CDS **340** may be updated using a common messaging protocol. For example, a node at the data center **171** may publish, via the network **112** to the vehicle **30**, a content update service. The CDS **340** may subscribe to the content update service, and may receive updated content via the network **112** while the vehicle **30** is in transit (e.g., when in flight) or while the vehicle **30** is not in transit (e.g., when parked at a terminal).

[0132] In an embodiment, the content may be updated via non-wireless methods. For example, one of the electronics system **301** may be connected to the content-loader **380**, which may include an interface for establishing a physical connection (e.g., via USB cable or plug) to receive content updates, which are then transmitted to a memory accessible by the CDS **340**. In an embodiment, the content-loader **380** is component of the CDS **340**. In some embodiments, the content-loader **380** is a component separate from the CDS **340**.

[0133] In an embodiment, the CDS **340** may publish content (e.g., a movie, entertainment or media service) for passengers on board the vehicle **30** via the in-vehicle network **312**. For example, in an embodiment the CDS **340** may wirelessly stream content via the in-vehicle network **312** to the consumer device **360***a*. An example CDS is described in more detail with reference to FIG. **4**.

[0134] 3.01(f) Consumer Devices **360***a-d*

[0135] The consumer devices **360***a-e* may be similar to the consumer device **60** shown in FIG. **6**. In an embodiment, the consumer devices **360***a-d* may discover (e.g., using a common messaging protocol) the CDS **340** (and any published entertainment/content services) via the wireless network **312**. In an embodiment, the consumer devices **360***a-d* may subscribe to the service so that users of the devices may select content (e.g., movies and other digital media) to consume. The consumer devices **360***a-e* may receive content transmitted from the CDS **340**, where the consumer device **360***a-e* may display the content (e.g., by playing a video). An example consumer device is described in further detail with reference to FIG. **6**.

[0136] 3.01(g) Source Device **399**

[0137] The source device **399** is an electronic device utilized to load content to the vehicle **30**. The source device **399** may be a data storage device (e.g., including flash memory) with a communication interface for establishing a connection with a device at the vehicle **30** (e.g., the content-loader **380** or the CDS **340**). The communication interface of the content-loader **399** may facilitate a physical link (e.g., via a universal serial bus port) with the vehicle **30**. In other instances, the communication interface may enable wireless communication with the vehicle **30**.

[0138] For example, various short-range wireless technologies (e.g., Bluetooth protocols, Near Field Communication protocols, etc.) or non-short-range wireless technologies may be utilized, depending on the embodiment. In some embodiments the content-loader **399** and vehicle **30** are directly connected (e.g., via a point-to-point connection or a bus connection). In some instances, the content-loader **399** and vehicle **30** may be connected via a network including other devices (e.g., via a wireless network with a star, mesh, ring, hybrid, or some other topology). Regardless of the exact nature of the connection, the content-loader **399** may connect to the vehicle **30** to load content to the vehicle **30**.

[0139] The content-loader **380** is device with an interface capable of establishing a communication link with another device or system (generally for the purpose of receiving content to be loaded to the vehicle **30**). For example, the content-loader **380** may include an interface for establishing a wired or wireless communication link with a source device **399**. Multimedia content may be transferred from the source device **399** to the content-loader **380** via the established link. The content-loader **380** provides the received content to the CDS **340** by storing the received content at a memory on the

vehicle **30** or by transmitting the received content to the CDS **340**. The content-loader **380** may be communicatively connected to the CDS **340** via the in-vehicle network **312** (e.g., via one or more buses or wireless links).

[0140] The content-loader **380** may include a physical interface, such as a USB interface, that is utilized by source devices **399** (i.e., devices transmitting content-data to the content-loader **380**) to load content to the vehicle **30**. As an example, the source device **399** may be a USB memory stick in an embodiment. In some embodiments, the content-loader **380** may alternatively or additionally include a wireless interface that the source device **399** can utilize for loading content to the vehicle **30**. Interactions between an example content-loader and an example CDS are described in detail with reference to FIG. **4**.

[0141] During a content loading procedure, a source device **399** may be communicatively connected to the content-loader **380** (which may be part of an LRU). The source device **399** may be "plugged in" to a port of the content-loader **380**. In some instances, a wireless communication link is established between the source device **399** and the content-loader **380**. In some embodiments, the process may be automated. For example, a source device **399** may establish a wireless connection with the vehicle **30** (e.g., via the content-loader **380**) upon detecting the vehicle **30**, the content-loader **380**, or a device associated with the vehicle **30**. Similarly, the vehicle **30** (or a device on the vehicle **30**) may establish a wireless connection upon detecting the content-loader **399**. In any event, once the content has been uploaded to the vehicle **30**, the vehicle **30** may provide the content to passengers (e.g., while in transit).

4. An Example CDS **40**

[0142] FIG. **4** illustrates an example CDS **40** according to an embodiment. Generally speaking, the CDS **40** is platform or system configured to distribute multimedia content to other systems or devices. Typically the CDS **40** distributes the multimedia content to consumer devices **60** (an example of which is shown in FIG. **6**). Generally speaking, the distributed multimedia content is consumed by an end-user of the consumer device **60**. For example, the CDS **40** may stream audio and/or video content to a consumer device **60**, enabling a user of the consumer device **60** to watch the video and/or listen to the audio.

[0143] The CDS **40** may operate in "connected mode" or in "autonomous mode." The CDS **40** is in "connected mode" when the CDS **40** is connected to an external network and able to communicate with the data center **171** shown in FIG. **1**. The CDS **40** is in "autonomous mode" when disconnected from other CDSs **40** and/or from the data center **171**.

[0144] In an embodiment, the CDS **40** is a single electronic device. In some embodiments, the CDS **40** is a distributed computing system, and may include one or more computers, hosts, and/or networking devices. In some embodiments, the CDS **40** may include one or more servers, each of which may be run on a dedicated machine (which may also be referred to as a server in certain circumstances) or on a non-dedicated machine (e.g., a single computer may host multiple servers in certain circumstances). Regardless of its exact architecture, the CDS **40** is generally vehicle-based. That is, the CDS **40** is generally installable or installed in or on a vehicle **30** (shown in FIG. **3**) and configured to deliver multimedia content to one or more consumer devices on board the vehicle **30** (or within a particular range of the CDS **40**).

[0145] In an embodiment, the CDS **40** is not vehicle-based. In such an embodiment, the general location and/or platform at which the CDS **40** is disposed may be referred to as a "station." As an example, the CDS **40** may be disposed at a housing, a room, a building, and/or some other structure or apparatus. In some instances, a CDS **40** may be installed to provide content-delivery capabilities at the station so that consumer devices within range of the station may receive content.

[0146] In an embodiment, the CDS **40** may be a component of an Auxiliary Computer Power Unit (ACPU) or may be in communication with an ACPU. The CDS **40** generally includes a processor **411** that is communicatively coupled to a communication interface **413** and a memory system ("memory") **415**.

[0147] 4.01 Processor **411**

[0148] In an embodiment, the processor **411** is configured to fetch and execute instructions stored at the memory **415**. The instructions may be stored as programs, applications, or modules. For example, the processor **411** may execute the modules **423** stored at the memory **415**. In an embodiment, the CDS **40** includes multiple processors **411**.

[0149] 4.02 Communication Interface **413**

[0150] The communication interface **413** is a component or group of components that enable the CDS **40** to communicate with other systems or devices. The communication interface **413** may include a wireless communication interface, a physical communication interface, or both. For example, the communication interface **413** may include a serial interface such as a Universal Serial Bus (USB) interface. In some embodiments the communication interface **413** may include a wireless interface (including or coupled to, e.g., one or more antennas for radio-frequency transmission and reception) for establishing a wireless connection with another device. For example, in some embodiments the communication interface **413** may include a short range wireless interface compliant with standards such as Bluetooth (operating in the 2400-2480 MHz frequency band) or Near Field Communication (operating in the 13.56 MHz frequency band).

[0151] 4.03 Memory **415**

[0152] In certain embodiments, the memory **415** may include volatile and/or non-volatile memory and may be removable or non-removable memory. For example, the memory **415** may include computer storage media in the form of random access memory (RAM), read only memory (ROM), EEPROM, FLASH memory or other memory technology, CD-ROM, digital versatile disks (DVD) or other optical disk storage, magnetic cassettes, magnetic tape, magnetic disk storage or other magnetic storage devices, or any other medium which can be used to store the desired information. The memory **415** may store data **421** and modules (e.g., programs or applications) **423**.

[0153] In certain embodiments, the memory **415** includes multiple memory drives and/or multiple memory arrays. For example, the memory **415** may include two or more solid state drives. In an embodiment, the memory **415** includes a partition (e.g., a log4 partition) containing soft-links to media folders stored at the memory **415**. The CDS **40** may be configured to recreate the partition on a new drive upon failure of the drive on which the partition resides.

[0154] 4.03(a) Data **421** on the Memory **415**

[0155] The data **421** may include data representing one or more of: a key-store or key collection **431**, a journal **432**, a library **433**, and/or license-data **434**. The data **421** may include data that the modules **423** operate on, data used as input for one or more of the module **423**, and/or data output by one or more of the modules **423**.

[0156] 4.03(a)(i) Key-store **431**

[0157] The key-store **431** may include keys to be used when delivering content (e.g., encryption/decryption keys). Each key in the key-store **431** may enable access to particular content, and may be associated with certain access rights specified by the license-data **434**. The keys may be keys capable of decrypting protected content, and the CDS **40** may track associations between keys and content stored at the library **433**.

[0158] The keys may be keys created using symmetric-key techniques. In such a scenario, a given key in the key-store **431** is both an encryption key and decryption key. In other words, the same key used to encrypt the content (e.g., at the data center **171** shown in FIG. **1**) is the key needed to decrypt the content. In some instances, the keys may be keys created using asymmetric-key techniques (sometimes called public-key techniques) involving encryption/decryption key pairs that are mathematically linked. In such instances, an encryption key (e.g., public key) is typically generated so that anything encrypted with the encryption key may only be decrypted with the decryption key (e.g., private key). Thus, the key-store **431** may include decryption keys (e.g., private keys) that are capable of decrypting content that has been encrypted using distinct encryption keys (e.g., public keys). In any event, the keys in the key-store **431** are cryptography keys capable of decrypting content in the library **433**.

[0159] Each key in the key store **431** is a piece of information or data representing a particular value. Generally, each key may include a specified number of alphanumeric characters, and any character set may be used. In some instances, key length is defined by a bit value. For example, a 32-bit key may include up to 32 binary characters, or up to eight hexadecimal characters. In some embodiments, key characters are limited to those selected from a particular set. For example, keys may be limited to characters selected from the ASCII character set (which includes 128 characters), hexadecimal characters (which includes 0-9 and A-F), or decimal characters (0-9). In an embodiment, keys may be limited to binary characters, and may be limited to a particular key size (e.g., 128-bit or 256 bit). In certain circumstances, a conversion process may be used to compare keys. For example, in an embodiment a hexadecimal or ASCII key may be converted to binary for purposes of key comparison. In an embodiment, the key-store **431** includes keys of various lengths. While longer keys are generally more secure in nature, the keys in the key-store **431** may generally be any suitable length.

[0160] As noted, keys in the key-store **431** may enable access to particular content. In particular, a key may enable access to content for a certain interval. The interval may be based on one or more factors, such as: time, vehicle status, data transfer, user and/or device status, delivery session, content status, or some combination thereof.

[0161] For example, a key that enables access based on time-based intervals may enable access for 30 minutes, 2 hours, 24 hours, etc. A key that enables access based on the status or movement of the vehicle 30 may enable access for a trip or a leg of a trip (e.g., during a particular flight). In some circumstances, keys may enable access during intervals associated with delivery sessions. For example, a new key may be assigned for every distinct content delivery session with a consumer device **60**, and a new key may be necessary for subsequent sessions. In an embodiment, a single key enables access for multiple sessions.

[0162] Further, access intervals may be based on data transfer, where, e.g., a key enables access until a user or consumer device **60** has received content-data exceeding a certain threshold (e.g., 2 GB of data). Regarding user and/or device status, access intervals may be based, e.g., on "good standing" of a user or device. For example, a "good standing" status may be revoked for a user or device if the CDS **40** receives notification that the user has tempered with access control mechanisms, or notification that the user provided fraudulent payment information.

[0163] As for access intervals determined based on content, in some embodiments, an access interval may be tied to a particular content title. For example, access to a given movie may be enabled for a certain number of playbacks (e.g., a user may be authorized to watch the movie only a single time). As another example, access intervals may be determined based on classifications for content (e.g., access to older movies may be enabled for a longer time or for more playbacks than would be enabled for new releases).

[0164] In some instances, a key may enable access for a short interval (e.g., for a short period of time). In such an embodiment, the CDS **40** may utilize multiple keys when delivering content, even, e.g., for a single content delivery session involving a single content title and a single consumer device **60**. In other words, the CDS **40** may utilize a new key on a semi-continuous basis (e.g., every 5 minutes) when delivering content. Semi-continuous key assignment may be beneficial where it is desirable to consistently authenticate and/or verify authorization for a user or device. In particular, semi-continuous key assignment may be used to reduce risks associated with an intercepted key, given that a particular intercepted key will enable content access for only a limited time.

[0165] 4.03(a)(ii) Journal **432**

[0166] The journal **432** includes status information relating to content that has been loaded, or is in the process of being loaded, to the memory **415** (e.g., via the content-loader **380** illustrated in FIG. **3**).

[0167] For example, the journal **432** may include "transfer status" data identifying the status of various content titles or files that have been, will be, and/or are in the process of being loaded to the vehicle **30**. The journal **432** may be referred to as a synchronization-state file identifying content that has been loaded to the vehicle **30** via a USB connection, and may include transfer status data relating to the loaded content. In an embodiment, the journal is maintained as long as a media service (e.g., a video service for streaming video) is active at the CDS **40**. Such a media service may be managed by the distributor **443**. The journal **432** may be xml formatted data. In an embodiment, the journal **432** may be a matrix table with a transfer status field for each file.

[0168] The journal **432** may include data regarding one or more content titles (i.e., relating to one or more movies, television shows, or other media titles). For each title, the journal **432** may include (i) an identifier or variable value unique to the title, (ii) an identifier or variable value for identifying a media type and/or file type. The journal **432**

may also include transfer status information (e.g., within an ACPU root area). The journal **432** may include data representing the title (e.g., a string or reference to a string for the title), as well as data representing one or more status indicators relevant to the title. These status indicators may indicate whether the following information is available: a title, a trailer for the title, a description for the title, a rating for the title, etc. In some embodiments, the memory **415** may store a summary file including a subset of information from the journal **432** pertaining to various content titles (e.g., identifying a content ID, a content type, and/or transfer status information). In an embodiment, the journal file may include calculated checksums and spare fields.

[0169] In an embodiment, the journal **432** includes synchronization-state information about loaded content, indicating whether or not the library **433** has been synchronized (or a degree to which it has been synchronized) with a collection of content on another device.

[0170] Example journal data is illustrated in Table 1. The example journal data includes variables to indicate whether various items are locally available (e.g., available at a memory on the vehicle **30**) to the CDS **40**. In particular, the example journal data indicates the availability of Boxart for the content title, availability of the content itself, availability of a trailer for the content title, availability of a description for the content title, and availability of a DRM key for the content title. In the illustrated embodiment, a value of "1" indicates that the item is available on the vehicle **30**. While Table 1 illustrates journal data relating to movies, in some embodiments the journal data includes data relating to other multimedia content.

[0171] 4.03(a)(iii) Library **433**

[0172] The library **433** includes content-data. The content-data typically represents one or more content-items (e.g., songs, movies, shows, games, etc.). The content-data in the library **433** may be content-data received at the CDS **40** via the communication interface **413**. Further, the content-data in the library **433** may have been loaded to the CDS **40** via a source device **399** and content-loader **380** (shown in FIG. **3**).

[0173] In an embodiment, the content-data stored at the library **433** is encrypted. Generally the content-data is received at the CDS **40** in an encrypted format. The CDS **40** stores the encrypted content-data at the library **433**. During a content-delivery session, the CDS **40** may retrieve encrypted content from the library **433** and may deliver the content to a content consumer device **60**. The content consumer device **60** may receive and decrypt the encrypted content using a key transmitted from the CDS. The key used by the content consumer device **60** to decrypt the content may be a key from the key-store **431** that is associated with the delivered content, transmitted by the CDS **40** (e.g., via the licensor **442**) to the content consumer device **60**. In an embodiment, the CDS **40** does not transmit a key to the content consumer device **60**. In such an embodiment, the content consumer device **60** may rely on a shared secret to generate or identify a key capable of decrypting the content.

[0174] In some embodiments, the content-data in the library **433** is unencrypted. The content-data may have been received as encrypted data and decrypted by the CDS **40**. In some instances, content-data may be received at the CDS **40** as unencrypted data.

[0175] In an embodiment, the CDS **40** encrypts content prior to delivery. For example, the CDS **40** may implement a multiple-encryption scheme, adding an encryption layer to already encrypted content-data. Accordingly, the CDS **40** may transmit encrypted data with multiple encryption layers. In some instances, the CDS **40** may perform "on-the-fly" encryption by encrypting content during, or prior to, the delivery process.

[0176] 4.03(a)(iv) License-data **434**

[0177] The license-data **434** includes data relating to issued licenses. In short, a license is an authorization or permission to access certain content. The license data **434** may contain a license record for each license, where each license record is a collection of information pertaining to the access rights granted for particular content in the library **433**. For example, a license record (sometimes referred to as a "license" for short) may include or reference a key from the key store **431** for decrypting particular content, as well as data representing a number of rules or conditions for accessing the particular content.

[0178] Each license record may be a collection of data that includes or references (i) a key (e.g., for encryption or decryption) from the key-store **431**, (ii) particular content associated with the key, (iii) identities associated with the key (e.g., particular ID(s) for consumer devices **60** or users of content consumers **60**), and/or (iv) access rights or rules associated with the key, the particular content, and/or the identities. In some instances the CDS **40** may use the license-data **434** to perform an authorization verification to verify that a particular content consumer device **60** is authorized to access particular content from the library **433**.

[0179] In an example authorization verification operation, the CDS **40** may receive a request for a key or a request for content (i.e., a content-request) from a consumer device **60**. The CDS **40** may check the license data **434** to determine whether content-delivery is permitted or authorized. In other words, the CDS **40** may determine whether the license data **434** indicates that the consumer device **60** (or user of the consumer device **60**) is permitted to receive content, and/or whether the consumer device **60** (or the user) is permitted to receive particular content (e.g., particular requested content).

[0180] To further illustrate, a content-request may include identification information. In an embodiment, the CDS **40** may request identification information from the consumer device **60**. Alternatively, the consumer device **60** may provide identification information without a request from the CDS **40**. Regardless, the CDS **40** may compare the provided identification information to the license-data **434** to determine whether the requested access is authorized. For example, the identification information may be a particular username and password. The CDS **40** may reject the request if the username/password combination does not match a username/password combination in the license-data **434**. As another example, the provided username/password combination may match a combination in the license-data **434**, but the CDS **40** may reject the request if the requested use is not authorized (e.g., the user/password combination is authorized to view a first movie, but not a second movie). In an embodiment, the identification information is an identity, such as a user ID or a device ID.

[0181] In an embodiment, the content consumer device **60** transmits identification to the CDS **40** without direct input from a user. In other words, the authorization process may occur in the background from the user's perspective, where, e.g., the content consumer device **60** sends an identifier

stored to memory, or generated in real-time, associated with the content consumer device **60** (e.g., based on a request received from the CDS **40**).

[0182] To further illustrate, the content-request may include a token tied to particular content. The particular content may be content requested or selected by the consumer device **60** (i.e., selected-content). In other words, a user may interact with the consumer device **60** to select a particular movie or television title, for example. Accordingly, a token may be transmitted to the CDS **40** that is tied to the particular movie or television title, enabling the CDS **40** to identify the content item selected by the user of the consumer device **60**.

[0183] As noted, the license-data **434** may identify access rights for content (e.g., for content the library **433**). For example, a license record may identify certain time periods during which content can be accessed (e.g., unlimited or limited access may be granted for **24** hours, a week, etc.); a certain duration for which content can be accessed (e.g., access may be granted for **2** hours of total playback); certain authorization codes which may be used to access content (e.g., access may be granted when a user provides an authorized code); certain authorized content; and certain authorized uses of content. In an embodiment, a key associated with a particular license record may only enable content-access so long as the access is consistent with the access rights specified by the license record.

[0184] An authorization code may be a unique identity or identifier, such as a serial number. In an embodiment, an authorization code may be issued to an authorized device or user. The user or device may provide identification information to the CDS **40** by providing an issued authorization code. The CDS **40** may then grant access for particular content upon authenticating the authorization code (i.e., upon determining that the provided code matches an authorized code identified in the license-data **434**). Authorization codes may be tied to certain authorized devices permitted to access the content (e.g., access may be granted to devices having a particular MAC address or a particular "fingerprint" generated based on device hardware). In an embodiment, the authorization codes may be tied to particular authorized users. For example, access may be granted based on a code entered by a user, such as a username, a password, a username/password combination, or a pin.

[0185] In some instances, the license-data **434** may include biometric information, or identification information generated based on biometric information, identifying authorized users. For example, the license-data **434** may include biometric information relating to fingerprint or eye scans.

[0186] Regarding authorized content specified by the license-data **434**, in some instances particular content titles may be authorized for use while others are not. Similarly, in some instances only particular types of content may be authorized for use (e.g., access to TV shows may be authorized, but access to movies may not be authorized).

[0187] Regarding authorized uses of content, the license-data **434** may identify authorized methods for providing content, and/or may identify authorized actions permitted to be taken with content once it has been provided. For example, streaming may be authorized, but saving content to a hard-drive for later use may not be authorized. As another example, the license-data **434** may indicate whether copying content is authorized, and/or how many copies are authorized. Similarly, the license-data **434** may indicate whether playback of content is authorized, as well as a number of times the content is authorized to be played or accessed.

[0188] 4.03(a)(v) Usage Log **435**

[0189] The usage log **435** may include historical data regarding content consumption by one or more consumer devices **60**. For example, the usage log **435** may include a record of particular content consumed by various devices **60**. The usage log **435** may be utilized to track content usage according to time, the amount of information consumed (e.g., according to megabytes, gigabytes, etc.), sessions, etc.

[0190] 4.03(b) Modules **423** on the Memory **415**

[0191] The modules **423** are applications or services that may be executed by a processor **411** of the CDS **40**. The modules **423** may include a content-loading manager ("CL manager") **441**, a licensor **442**, a distributor **443**, a portal **444**, and/or a reporter **445**.

[0192] In an embodiment, the CDS **40** may include one or more servers providing the functionality associated with the module(s) **423**. In an embodiment, the CDS **40** may include a single machine that hosts such servers. In some embodiments, the CDS **40** comprises a number of machines (e.g., in a distributed computing environment) hosting such servers. As an example, each of the modules **423** may be hosted on a dedicated machine.

[0193] 4.03(b)(i) CL Manager **441**

[0194] The CL manager **441** manages content-loading procedures for transferring content-data to the memory **415**. The content-data may be received at the CDS **40** via the communication interface **413**, and/or via the content-loader **380** shown in FIG. **3**. In some instances, the content-data is received from another device capable of establishing connection to the communication interface **413**. Regardless of how it is received, loaded content-data may be stored to the library **433** at the memory **415**. In addition to transferring content to the memory **415**, the CL manager **441** may perform an error detection procedure on content-data (e.g., a checksum procedure).

[0195] The CDS **40** may receive content included in a content-distribution. A content-distribution is a collection of content and files associated with the content. A content-distribution may include: a set of content (i.e., content-data for a set of titles), a manifest file identifying the particular content in the set of content, various accessory files, and/or a second manifest file identifying the particular accessory files. The accessory files may include catalog files, user interface files, DRM database files, and/or public keys for encrypting credit card data. After receiving a content-distribution, the content-loader **380** may forward the content-distribution to the CDS **40**.

[0196] The CL manager **441** causes the processor **411** to transfer received content-data to the memory **415**. The content-data may be received via wireless or wired connection to the communication interface **413**. In an embodiment, the content-data is automatically transferred to the memory **415** (e.g., when the processor **411** detects content-data available for transfer via the communication interface **413**) with minimal or no involvement from a user of the CDS **40** or of the transferring device or system. In some embodiments, the CDS **40** may detect (e.g., via a signal from the content-loader **380**) a connection between the content-loader **380** and a device capable of transferring content (e.g., a potential source device **399** such as that shown in FIG. **3**). For example, the CDS **40** may detect that the content-loader

380 has established a wired connection to a source device **399** (e.g., detecting connection via a port, such as a USB port, at the content-loader **380**) or a wireless connection to the device (e.g., detecting radio communication). Such detection may cause the CL manager **441** to trigger a content transfer, resulting in content-data being transmitted from the source device **399** to the content-loader **380**, where it may be forwarded to CDS **40** to be stored at the memory **415**.

[0197] In some instances, a user may initiate or facilitate data transfer to the memory **415**. For example, a user may interact with the CDS **40** at a user-interface (not shown) of the CDS **40** or at a user interface of the source device **399**. The user's interaction may result in a command being received (e.g., via a user interface or via the communication interface **413**) at the processor **411**. In response to the command, the CL manager **441** may cause the processor **411** to transfer content-data received at the communication interface **413** to the memory **415** (where the content-data may be stored as part of the library **433**). In some instances, the CDS **40** may transmit a signal (e.g., a status signal) via the communication interface **413** to notify the transferring system when the content-data has completed transfer.

[0198] In an embodiment, the CL manager **441** causes the processor **411** to decompress compressed files in the content-distribution (if necessary), and to log results of the content-loading process. In particular, the processor **411** may log results of the content-loading process by generating or updating the journal **432**. For a content-loading process relating to a particular content-distribution, the CL manager **441** may cause the processor **411** to create or update a "transfer status" variable in the journal **432** for each file in the content-distribution. The "transfer status" variable generally indicates whether a particular file from the content-distribution is present on the vehicle **30** (e.g., stored at the memory **415** of the CDS **40**). If the journal **432** indicates that a file is not present on the vehicle **30**, an error may have occurred in the content-loading process. In short, the journal **432** includes "transfer status" information for one or more content-distributions that have been loaded to a CDS **40**. As a result, the journal **432** may later be referenced to determine whether a particular file from a content-distribution was successfully transferred to the memory **415** of the CDS **40** during a content-loading procedure.

[0199] 4.03(b)(ii) Licensor **442**

[0200] The licensor **442** may grant and/or verify access rights for particular identities requesting access to content (e.g., requesting content delivery). An identity may correspond to a device (e.g., a device ID corresponding to a consumer device **60**) or a user (e.g., a user ID corresponding to a particular person). In an embodiment, the licensor **442** is a server hosted by a dedicated machine. In some embodiments, the licensor **442** is a module executed at a machine that hosts other of the modules **423**.

[0201] The licensor **442** may grant access rights based on a financial transaction with a consumer. In some instances, the licensor **442** acts as a payment processor that handles financial transactions with consumer devices **60**. In particular, the licensor **442** may include the payment processor **206** shown in FIG. **2**, enabling the licensor **442** to handle financial transactions.

[0202] In an embodiment, the licensor **442** is a proxy licensor that coordinates with a license server external to the CDS **40**. For example, the licensor **442** may manage a set of keys, from a collection of keys managed by the external license server, in place of the external license server. Further, when acting as a proxy license server, the licensor **442** may periodically synchronize with the external license server. By acting as a proxy licensor, the licensor **442** enables the CDS **40** to maintain licensing functionality regardless of the status of its connection to an external licensing server.

[0203] In some embodiments, financial transactions are handled by a payment processor separate from the licensor **442**. For example, the licensor **442** may call a payment processor system (which may be internally or externally located relative to the vehicle **30**) to handle financial transactions. The payment processor may then notify the licensor **442** of successful or unsuccessful payment. The licensor **442** generally grants access rights if a payment is successful, and denies access rights if a payment is unsuccessful.

[0204] When granting access rights, the licensor **442** creates or updates the license-data **434** to reflect the granted access rights. For example, the license-data **434** may be updated to indicate that a particular content consumer device **60** (e.g., identified by a specific device ID) is authorized to stream a particular content title (e.g., identified by a specific content title ID).

[0205] In an embodiment, the licensor **442** may transmit a license or key to the appropriate content consumer device **60** after access rights have been granted. The license or key (e.g., a decryption key) may enable the content consumer device **60** to access content (e.g., to decrypt an encrypted movie file and provide the movie via a display and/or speakers). The content consumer device **60** may store a received license or key in some instances. For example, the license or key may be stored to maintain proof of authorization or proof of payment.

[0206] In an embodiment, the CDS **40** may perform an authorization verification before initiating a delivery session in order to verify that a content consumer device **60** is authorized to receive the content. In such an embodiment, the licensor **442** may handle authorization requests and notify the distributor **443** of whether a particular content-request is authorized. The authorization verification may include the CDS **40** checking the license-data **434** at the memory **415** and/or requesting a license from the content consumer device **60** to determine if the requested use is authorized. If the consumer device **60** does not have a license or key, the CDS **40** may initiate a payment processing operation so that the end-user of the consumer device **60** can pay for content. The CDS **40** may transmit a license and/or key to the consumer device **60** payment information is received, processed, and/or verified.

[0207] 4.03(b)(iii) Content Distributor **443**

[0208] The distributor **443** may be utilized by the CDS **40** to (i) receive content-selections from a content consumer device **60**, and (ii) transmit content-data for the selected content to the content consumer device **60**. In an embodiment, the distributor **443** is a server hosted by a dedicated machine. In some embodiments, the distributor **443** is a module executed at a machine that hosts other of the modules **423**.

[0209] In example operation, the distributor **443** may be executed by the processor **411** to transmit via the communication interface **413** data representing available content. In example operation, content-selection data may subsequently be received at the communication interface **413**. Generally speaking, received content-selection data originates from a content consumer device **60**. In any event, the distributor

443 may cause the processor **411** to (i) identify particular content from the library **433** based on the received content-selection data, (ii) retrieve content-data representing the particular content from the library **433**, and (iii) transmit the content-data via the communication interface **413** to the appropriate content consumer device **60**.

[0210] Generally speaking, the CDS **40** grants or verifies authorization for the selected content (e.g., by initiating a payment process or verifying previous payment) before retrieving and sending the content-data to the appropriate content consumer device **60**. The licensor **442** may handle the authorization process before the distributor **443** proceeds with initiating a content-delivery session to transmit content-data.

[0211] In an embodiment, the distributor **443** may include, or may invoke, a content service and/or a consumer portal **444** to enable the CDS **40** to provide the above described functionality. In example operation of such an embodiment, a content-selection is received via the portal **444** and the content service transmits content-data representing the selected content. The distributor **443** may manage sessions between the CDS **40** and content consumers **60**.

[0212] 4.03(b)(iv) Consumer Portal **444**

[0213] The consumer portal ("portal") **444** is a module or service that facilitates interactions between consumer devices **60** and the CDS **40**. In particular, the portal **444** operates to provide an interface (e.g., a graphical interface) to the content consumer device **60**, enabling a user of the content consumer device **60** to select or request content for consumption. The portal **444** may receive a content-selection from the consumer device **60**. The distributor **443** may transmit content-data to the consumer device **260** based on the received content-selection.

[0214] The portal **444** may include one or more services or applications executed at the CDS **40**. The portal **444** may access and provide various resources (e.g., documents, files, and/or services) to other devices, such as the consumer devices **60** (e.g., via the in-vehicle network **312** shown in FIG. **3**). In particular, the portal **444** may transmit content-option data to the content consumer device **60**. The content-option data generally represents content options available to a content consumer device **60** for potential selection. For example, the content options may include content stored in the library **433**, or a subset of the stored content. The content options may be identified by text, image, or any other suitable method.

[0215] In certain embodiments, the portal **444** may be (or may include) a web page and/or service that can be hosted by the CDS **40** and made available to a consumer device **60**. The content-option data may be transmitted using such a web page and/or service to facilitate content-selection at a content consumer device **60**. In addition to the content-option data, the portal **444** may transmit other data to facilitate content-selection by a content consumer device **60**. For example, the portal **444** may transmit graphic data, which may be utilized by the content consumer device **60** to provide a content-selection interface for a user. More particularly, the graphic data may specify a particular layout and/or particular image(s) to be provided as part of the content-selection interface (e.g., a layout of a web page).

[0216] In some embodiments, the portal **444** may interact with a client application at the content consumer device **60**. In some of these embodiments, the content consumer device **60** may largely rely on the client application and locally stored data at the content consumer device **60** to provide the content-selection interface, requiring little from the portal **444** other than content options.

[0217] 4.03(b)(v) Reporter **445**

[0218] The reporter **445** reports content delivery performed at CDS **40**. In particular, the reporter **445** causes the processor **411** to transmit a report via the communication interface **413**. In an embodiment, the report is received at the data center data center **171** shown in FIG. **1**B.

5. Example Methods for Content Loading, Licensing, Delivering, and Tracking

[0219] 5.01 Content Loading

[0220] FIG. **5**A illustrates example method **500***a* for loading content to a vehicle **30** (shown in FIG. **3**) according to an embodiment. The method **500***a* may be implemented by a content-loader and/or CDS. The method **500***a* may be saved as a set of instructions, routines, programs, or modules at computer readable media found, for example, in memory devices accessible by the content-loader **380** and/or the vehicle **30**.

[0221] The method **500***a* begins when a source device **399** is communicatively coupled to an electronics system **301** of the vehicle **30** (e.g., connected to the content-loader **380** and/or the CDS **340**) (block **502**). The source device **399** may be any suitable electronic device with a memory for storing content-data. The source device **399** may include a group of content files corresponding to the content itself (e.g., video or audio data). The group of files stored on the source device **399** may be referred to as a "content-distribution." Generally speaking, the content-distribution originates from a server or some other computer system used to host multimedia content. In some instances, the content-distribution is copied or transmitted from the data center **171**.

[0222] The source device **399** may be physically coupled to the content-loader **380** (e.g., via a port at the content-loader **380**, such as a USB port). In some embodiments, the source device **399** may be wirelessly coupled to the content-loader **380** via one or more radio-frequency ("RF") channels. The RF channels may be part of a near-field communication link or wireless network such as a personal area network ("PAN"), a local area network ("LAN"), and/or a wide area network ("WAN"), depending on the embodiment. In some instances the content-loader **380** and/or CDS **40** automatically detects new source device **399** connections to the content-loader **380**. Once connected, the CDS **40** may mount the source device **399** and make the file systems, files, and directories accessible by the content-loader **380**.

[0223] Upon connection, the content-distribution may be loaded to the vehicle **30** via the content-loader **380** (blocks **504** and **506**). The content-loader **380** may store received content files to a memory on the vehicle **30** (e.g., the memory **415** shown in FIG. **4**). In an embodiment, the content-distribution data is stored at a memory accessible by an ACPU. The content-distribution may be loaded as a file or group of files, and may include compressed and/or uncompressed files.

[0224] The content-distribution data loaded to the vehicle **30** may be encrypted. In an embodiment, content-distribution data may have been encrypted by a packager or license server (e.g., located at the data center **171**). Generally, encryption keys associated with the encrypted content are

loaded to the vehicle **30** along with the encrypted content. The keys may be stored to the key-store **431** shown in FIG. **4**.

[0225] In an embodiment, the content-distribution may include accessory files relating to the content files. For example, accessory files may include catalog files, user interface files, DRM database files, and/or public key(s) for encrypting credit card data. In an embodiment, an xml-formatted manifest file references the accessory files relating to the content files. This manifest file may be loaded to the vehicle **30**, and the vehicle **30** may utilize the manifest file to copy the accessory files listed in the manifest file to a memory at the vehicle **30** (e.g., memory **415**). Table 2 shows an example manifest file that references accessory files. The accessory files may be loaded to the vehicle **30** before the content files are loaded.

[0226] In some embodiments, the CDS **40** may perform an error detection procedure on the accessory files. The error detection procedure may be performed as the accessory files are loaded to the vehicle **30**. As an example, the CDS **40** may perform a checksum verification procedure. A checksum is a function or calculation that generates an output using a particular file or group of data as input (an accessory file in this case). The output of the checksum function is referred to as a checksum or hash value. While the checksum function should always produce the same hash value for a particular file, any change to the input file (i.e., the accessory file) will result in the checksum function generating a different hash value. Accordingly, checksum calculations may be used to determine whether errors have been introduced during transmission (e.g., from the content-loader **380** to the vehicle **30**) or storage of the content. In an embodiment, the calculated checksum may be an md5sum calculated by the content-loader **380**. In some instances, the md5sum is calculated by a USB stick manufacturer. In some embodiments, checksum functions other than md5sum may additionally or alternatively be utilized.

[0227] If the checksum verification fails for a particular accessory file that was copied to a memory on the vehicle **30**, the accessory file may be removed from the memory (block **515**). If the checksum verification passes, the accessory file may be decompressed if necessary. If the transferred content file was not compressed, decompression may not be performed.

[0228] Once the accessory files have been copied, verified, and decompressed (where necessary), the content files may be loaded to the vehicle **30** in an embodiment. In some instances, the content files are loaded as part of a synchronization process. For synchronization, a check may be performed to verify that content files in the content-distribution are not already loaded to the vehicle **30**. Performing a synchronization process may include generating or modifying journal data, which may be stored as the journal **464** shown in FIG. **4**. For example, a journal file may be constructed based on files copied for a particular batch (e.g., a particular loading session during which a group of content files were loaded to the vehicle **30**).

[0229] In an embodiment, the keys are uploaded to the vehicle **30** by utilizing a Sync Service.

[0230] 5.02 Content Access Management and Licensing

[0231] FIG. **5**B illustrates an example method **500***b* for managing access to content and licensing content. The method **500***b* may be implemented by the CDS **40** shown in FIG. **4**. The method **500***b* may be saved as a set of instructions, routines, programs, or modules at computer readable media found, for example, at the memory **415** of the CDS **40**. In some instances, the method **500***b* is implemented by a server, such as a DRM server or a licensing server. While the method **500***b* is described with reference to the CDS **40**, the method **500***b* may be implemented according to other embodiments not depicted in FIG. **4**.

[0232] The method **500***b* begins when the CDS **40** receives a content-request or a license-request (block **520**). Generally, the request originates at a consumer device **60**. The request may be received at the communication interface **413** (e.g., wirelessly) of the CDS **40** via the in-vehicle network **312** (shown in FIG. **3**).

[0233] The CDS **40** may check license data **434** stored at the memory **415** to determine whether the requested access is authorized (blocks **521** and **522**). For example, the CDS **40** may determine whether a license record exists pertaining to a received identity (e.g., a consumer ID or a user ID) or token (e.g., a content identifier). The identity and/or token may be received at the CDS **40** before, concurrently with, or after the content-request. For example, the identity and/or token may be included in the received data representing the content-request. In some instances, the identity and/or token are received at the CDS **40** after the content-request is received. For example, the CDS **40** may request either or both the identity and token after receiving the content-request.

[0234] In any event, if an appropriate license record is identified, the record may include data indicating that the requested access is authorized or not authorized. In some instances, the record may include certain rules, restrictions, or conditions for authorization (e.g., relating to time, download limits, number of views, etc.). If a license record does not exist, the CDS **40** may (i) request that a data center (e.g., data center **171** shown in FIG. **1**) verify authorization (if communication with the data center is possible), or (ii) begin a payment processing procedure.

[0235] Regarding the data center authorization (block **523**), the CDS **40** may transmit a request (e.g., via the network **112**) that the data center **171** (or more specifically, a server at the data center **171**) verify that the requested access is authorized. A signal may be transmitted to and received at the CDS **40** indicating that the access is authorized or not authorized. If not authorized, the CDS **40** may reject the content-request of the consumer device **60**. If authorized, the CDS **40** may transmit a key to be received at the consumer device **60** so that the consumer device **60** can decrypt and display content (the content may also be sent by the CDS **40**, e.g., via the distributor **443**) (block **529**). It should be noted that block **523** is not always implemented. For example, when the CDS **40** is operating in autonomous mode, the CDS **40** typically will not communicate with the data center **171**. Accordingly, block **523** may be skipped in certain circumstances.

[0236] The CDS **40** may implement a payment processing procedure (block **523**). In some embodiments, the CDS **40** may implement a payment processing procedure by establishing communication between the consumer device **60** and a payment processor. The payment processor may be located on the vehicle **30** or off the vehicle **30**. In an embodiment, the payment processor is an e-commerce payment system accessible via a network connection (e.g., accessible via connection to the world-wide web). In an embodiment, the payment processor is a component of the CDN **10***b*, and may

be located at the data center **171**. In some instances, the payment processor is managed by a third party, and may not be a component of the data center **171**. In any event, the CDS **40** may implement the payment processing procedure by establishing communication between the consumer device **60** and a payment processor (e.g., via the network **112**). In such a scenario, the CDS **40** may receive notification of successful payment from the payment processor via the network **112**.

[0237] In some instances, the CDS **40** implements a payment processor without accessing an external network. For example, the CDS **40** may implement a payment processing procedure by requesting payment information from the consumer device **60**. The consumer device **60** may transmit payment information (e.g., credit card information) that is received at the CDS **40**. Upon receiving the payment information, the CDS **40** may generate a license (e.g., by updating the license-data **434**) and transmitting a key to the consumer device **60** (blocks **528** and **529**). Such a license may be temporary in nature.

[0238] For example, the license may permit content access until the CDS **40** can establish communication with the data center **171** to verify the validity of the payment information or to finalize a financial transaction with the payment information. The CDS **40** may transmit the payment information to the data center **171**. The data center **171** may initiate a financial transaction using the payment information (e.g., by interacting with third party credit card processing systems). The CDS **40** may receive a signal from the data center **171** indicating that the financial transaction was successful or unsuccessful.

[0239] If the CDS **40** receives a signal from the data center **171** indicating that a financial transaction using the payment information was unsuccessful, the CDS **40** may stop providing content that it may have been providing in accordance with the temporary license. If the CDS **40** receives a signal from the data center **171** indicating that a financial transaction was successful, the CDS **40** may provide content, or continue providing content, as it was with the temporary license. In some instance the CDS **40** may also update the license-data **434** to indicate that the payment information has been processed and that a financial transaction has been successfully carried out.

[0240] If a payment is not successfully processed, the CDS **40** may not issue a license (block **526**). In some instances, payment may be unsuccessful because the consumer device **60** fails to provide payment information to the CDS **40** or to a payment processor. In other instances, payment may be unsuccessful because the payment information received from the consumer device **60** is not valid. For example, the consumer device **60** may provide credit card information for an expired or overdrawn credit card. In certain circumstances, a license may be issued despite a payment not being processed. For example, the CDS **40** may issue a license with the expectation that payment information will later be received from the consumer device **60**. To illustrate, a CDS **40** may provide content and/or keys during a flight, and may subsequently request payment information (e.g., at the end of the flight). Such operation may be beneficial where a payment history exists for the consumer device **60** (or the user of the consumer device **60**) suggesting, e.g., that such a transaction is low-risk. In some instances, the CDS **40** or the data center **171** may have pre-existing payment information. If the pre-existing payment information has been previously processed, e.g., the CDS **40** may provide access to content without requiring payment information and/or without requiring immediate processing of a financial transaction.

[0241] As noted, the CDS **40** may issue a license (block **528**). Issuing a license typically includes creating a license record (e.g., at the memory **415**) relating to access rights. For example, a license record may be added to the license-data **434**. Further, issuing a license generally includes assigning a key (e.g., an encryption and/or decryption key) for accessing the content. For example, the CDS **40** may assign a key, from the key-store **461**, to a particular user or a particular consumer device **60**.

[0242] After issuing a license, license-data and/or a key for decrypting the content may be transmitted to the consumer device **60**. The transmitted license-data may include unique information corresponding to a particular license record in the license-data **434**. For example, the transmitted license-data may include a key, token, or authorization code. In some circumstances, the receiving consumer device **60** may receive the license and later transmit the license to the CDS **40** as part of an authorization verification process. In short, a user or consumer device **60** may rely on the license to prove that a particular use of content is authorized. Further, in some embodiments the transmitted license may be digitally signed (e.g., by the CDS **40**). Accordingly, the transmitted license may later be verified as a legitimately issued license.

[0243] The CDS **40** may create or update a record (e.g., the license-data **434** or the usage log **435**) in light of licenses that have been generated, keys that have been assigned or sent to consumers **60**, and/or content-data that has been delivered to consumers **60**.

[0244] 5.03 Content Delivery and Tracking

[0245] FIG. **5**C illustrates an example method **500***c* delivering content and tracking delivery. The method **500***c* may be implemented at the CDS **40** (shown in FIG. **4**). The method **500***c* may be saved as a set of instructions, routines, programs, or modules at computer readable media found, for example, at memory devices accessible by the CDS **40**. While the method **500***c* is described with reference to the CDS **40**, the methods **500***a* and **500***b* may be implemented according to other embodiments not depicted in FIG. **4**.

[0246] The method **500***c* begins when the CDS **40** receives a request to access content (block **540**). In general, the request originates at a consumer device **60**. The CDS **40** verifies that the requested access is authorized (block **542**). For example, the request may represent a request to watch "The Wizard of Oz." Accordingly, the CDS **40** may verify that the requesting user or consumer device **60** is authorized to watch "The Wizard of Oz." Specifically, the CDS **40** may check the license-data **434** to verify authorization.

[0247] In example operation, the CDS **40** receives identification information associated with the request. The CDS **40** may perform a lookup with respect to the license-data **434** to identify a license record corresponding to the identification information. If a corresponding license record exists, the CDS **40** may determine whether access to "The Wizard of Oz" is authorized according to the corresponding license record. For example, the CDS **40** may compare a received content identifier ("ID") to one or more content IDs referenced by the license record. A match between a received ID and an ID reference by the license record may

result in a verification of authorization. On the other hand, failure to identify a match may result in a failure to verify.

[0248] When authorization is verified, the CDS **40** delivers the appropriate content-data. In particular, the CDS **40** may transmit content-data (e.g., audio and/or video data) to the requesting consumer device **60**.

[0249] The CDS **40** may create a record of the delivery (block **546**). In an embodiment, a record of the delivery is created by updating the license-data **434** or the usage log **435** based on the key assigned for the delivery (which may occur prior to delivering the content). For example, in some embodiments, a new key is assigned for every new delivery session. The license-data **434** and/or usage log **435** may include a record of every key that has been assigned. As a result, content delivery sessions may be identified by identifying key assignments included in the license-data **434**. In some embodiments, a single key may be utilized for more than one delivery session, or for more than a single content title.

[0250] The license-data **434** may include an access log associated with each assigned key. For example, an access log may be associated to key XYZ, and may include an attribute for "accessed titles" that identifies content IDs for content accessed using key XYZ. The access log may also include other attributes, such as time watched (e.g., identifying how many minutes or hours of content have been consumed using key XYZ), time/date of key assignment, most recent user activity date (e.g., identifying how far along a user was in watching a video when the last session terminated), etc.

[0251] In some circumstances, the CDS **40** may assign a key and/or transmit a key to the content consumer device **60** (block **548**). For example, the CDS **40** may determine that the license data **434** indicates that the requested access is authorized. Accordingly, the CDS **40** may transmit a key to the consumer device **60** so that the consumer device **60** can decrypt and display content. As described in further detail with reference to FIG. **5**B, the CDS **40** may, in some instances, implement a licensing process (see, e.g., method **500***b*) to grant the requesting consumer device **60** access rights (e.g., after a consumer has provided payment information). In some instances, the CDS **40** does not transmit a key to the consumer device **60** after verifying that the requested access is authorized. For example, the consumer device **60** may request to resume accessing content when access has previously been granted. In such a situation, the consumer device **60** may have already received a key for decrypting content. Accordingly, the CDS **40** may not transmit a key to the consumer device **60**.

6. An Example Consumer Device **60**

[0252] FIG. **6** illustrates an example content consumer device **60** ("consumer device **60**") according to an embodiment. Examples a consumer device **60** may include a laptop computer, a desktop computer, a tablet, a phone, or another electronic device with a user interface capable of presenting multimedia content. The consumer device **60** may be communicatively coupled to a CDS **40** (shown in FIG. **4**) via a network such as the in-vehicle network **312** (shown in FIG. **3**). For example, the consumer device **60** may wirelessly send and receive.

[0253] In example operation, the consumer device **60** may be utilized to consume multimedia content. In particular, the consumer device **60** may connect to a CDN and receive content via a CDS **40** (shown in FIG. **4**). As a result, the consumer device **60** allows a user to enjoy access to a library of content made available via a CDS **40**, sometimes even in instances when the CDS **40** and the consumer device **60** have no access to an external network.

[0254] The consumer device **60** includes one or more processors **611** communicatively connected (e.g., via a system bus) to: a communication interface **613**, a memory **615**, and a display **617**. The consumer device **60** may connect to a network (e.g., the in-vehicle network **312** shown in FIG. **3**) via the communication interface **613**. The consumer device **60** may utilize the communication interface **613** to wirelessly send and receive data (e.g., to communicate with the CDS **40** shown in FIG. **4**).

[0255] In example operation, the consumer device **60** transmits a content-request via the communication interface **613**. The consumer device **60** receives content via the communication interface **613**. The processor **611** may cause the received content to be (i) stored at the memory **615** and/or (ii) displayed by the consumer device **60** via the display **617**. The display **617** may be any display, screen, monitor, or projector suitable for displaying images and/or video output. The consumer device **60** may also include speakers (not shown) for providing audio output.

[0256] The memory **615** may include volatile and/or non-volatile memory. The memory **615** includes data **621** and modules **623**. In an embodiment, the data **621** includes content-data **631** and/or log data **632**. The modules **623** include a CDN client **641** and a browser **642**. The modules **623** may include modules not shown (e.g., operating system modules, additional multimedia modules, etc.)

[0257] 6.01 Content-data **631**

[0258] The content-data **631** comprises content-data received via the communication interface **613**. In an embodiment, the content-data **631** may represent streaming multimedia content received at the communication interface **613**. The content-data **631** may be stored as a temporary file (e.g., in a buffer or cache) to be retrieved and played, e.g., as the content-data **631** is received at the communication interface **613** (or in proximity to when the content-data **631** is received). In other words, the content-data **631** may be retrieved for playback before all of the content-data for a particular content title has been received by the consumer device **60**.

[0259] In an embodiment, the content-data **631** is stored as a non-temporary file. For example, in some instances the content-data **631** may be stored for retrieval and playback at a time subsequent to receiving the content-data **631** (e.g., minutes, hours, or even days later).

[0260] 6.02 Log Data **632**

[0261] The log data **632** generally represents a historical log of actions taken by the consumer device **60** with respect to the content-data **631**. For example, the log **632** may identify titles (e.g., movie titles, or identifiers associated with movie titles) for the content-data **631**. The log **632** may include one or more data trackers or time trackers. For example, the log **632** may indicate an amount of data (e.g., in megabytes, gigabytes, etc.) received or accessed via the consumer device **60**, and/or a measure of time for content received or accessed (e.g., indicating that **30** minutes of a movie have been received by the consumer device **60** or displayed by the consumer device **60**). In some instances, an external device (e.g., the CDS **40** shown in FIG. **4**, or a device at the data center **171** shown in FIG. **1**) may "audit"

the consumer device **60**, where the consumer device **60** sends the log **632** (or some portion thereof) to the external device.

[0262] 6.03 Key **633**

[0263] The key **633** is a cryptography key (i.e., a piece of data capable of being used as input for a cryptographic system) associated with the content-data **631**. Typically the content-data **631** is encrypted and not accessible (e.g., for playback) without a key such as the key **633**. Utilizing the key **633**, the consumer device **60** may decrypt encrypted content-data **631**, enabling a user of the consumer device **60** to access the content represented by the content-data **631**.

[0264] Generally speaking, the key **633** is received by the consumer device **60** via the communication interface **613** before being stored at the memory **615**. The key **633** is typically received after the consumer device **60** is granted authorization to access the content-data **631**. For example, the licensor **242** (shown in FIG. **2**) or the licensor **442** of the CDS **40** (shown in FIG. **4**) may grant the consumer device **60** authorization to access the content-data **631**, and may send the key **633** to the consumer device **60**. In some instances, the consumer device **60** utilizes multiple keys **633** to decrypt content-data **631**.

[0265] 6.04 CDN Client **641** & Browser **642**

[0266] Generally speaking, the CDN client **641** is a module configured to receive and display content. In an embodiment, the CDN client **641** may be configured to provide a user-interface for receiving a content-selection from a user of the consumer device **60** (i.e., a content-selection interface), and to transmit the content-selection to a CDS **40** (shown in FIG. **4**). The CDN client **641** may subsequently receive and display content corresponding to the content-selection.

[0267] More particularly, the CDN client **641** may cause the processor **611** to: (i) store content, received at the communication interface **613**, to the memory **615** as content-data **631**; and (ii) display, via the display **617**, the content represented by the content-data **631**. The CDN client **641** may decrypt the content-data **631** using the key **633** before displaying the content via the display **617**.

[0268] The CDN client **641** may be a dedicated module or a non-dedicated module, depending on the embodiment. For example, the CDN client **641** is a stand-alone client in an embodiment. In some embodiments, the CDN client **641** is a plug-in for another application. In such embodiments, the CDN client **641** enables the application to decrypt and display content that the application might otherwise have no way of decrypting and displaying. For example, the CDN client **641** may be a plug-in for a media player application or for a browser **642**.

[0269] In an embodiment, the browser **642** is capable of content playback. For example, the browser **642** may support HTML5 based playback and/or Flash based playback. In some instances, the browser **642** may serve as an interface for content-selection. In such instances, the browser **642** may launch a dedicated media player to display content (e.g., after content has been selected).

Additional Considerations

[0270] Although this text sets forth a detailed description of numerous different embodiments, it should be understood that the legal scope of the description is defined by the words of the claims set forth at the end of this patent and equivalents. The detailed description is to be construed as exemplary only and does not describe every possible embodiment since describing every possible embodiment would be impractical. Numerous alternative embodiments could be implemented, using either current technology or technology developed after the filing date of this patent, which would still fall within the scope of the claims.

[0271] The term "processor" generally refers to a hardware processor or processing unit that fetches, decodes, and executes instructions. An "instruction" generally represents a particular operation to be carried out by a processor. Processors may be designed or configured to be compatible with an "instruction-set" that includes particular instructions. Each instruction may include a command and/or an operand that specifies data (or a memory location where data is stored) to be worked upon.

[0272] some instances, a "processor" includes a control unit and/or an arithmetic/logic unit (ALU). A control unit includes circuitry used to direct operation of the processor. For example, the control unit may fetch instructions from memory; decode the instructions; direct appropriate data to be moved from memory to other components (e.g., the ALU); execute the instructions; and/or stored data resulting from the executed instructions. The control unit may utilize the ALU to perform an operation by executing instructions (e.g., arithmetic or logical instructions). The ALU may store data resulting from operation in memory or in a register.

[0273] Examples of "processors" include a central processing unit (CPU), a microprocessor, an application-specific instruction-set processor (ASIP), a graphics processing unit (GPU), or some combination thereof. An ASIP is generally a component used in a system-on-a-chip design, wherein the instruction set of the ASIP is tailored to a specific application. In some embodiments, the term "processor" may refer to a component of an application-specific integrated circuit (ASIC) customized for a particular use. An ASIC may additionally or alternatively include memory blocks (e.g., ROM, RAM, EEPROM, flash memory, etc.). ASICs, FPGAs, and other integrated circuits (ICs) may be designed using a hardware description language (HDL).

[0274] Throughout this specification, plural instances may implement components, operations, or structures described as a single instance. Although individual operations of one or more methods are illustrated and described as separate operations, one or more of the individual operations may be performed concurrently, and nothing requires that the operations be performed in the order illustrated. Structures and functionality presented as separate components in example configurations may be implemented as a combined structure or component. Similarly, structures and functionality presented as a single component may be implemented as separate components. These and other variations, modifications, additions, and improvements fall within the scope of the subject matter herein.

[0275] Additionally, certain embodiments are described herein as including logic or a number of routines, subroutines, applications, or instructions. These may constitute either software (e.g., code embodied on a machine-readable medium) or hardware. In hardware, the routines, etc., are tangible units capable of performing certain operations and may be configured or arranged in a certain manner. In example embodiments, one or more computer systems (e.g., a standalone, client or server computer system) or one or more hardware modules of a computer system (e.g., a processor or a group of processors) may be configured by

software (e.g., an application or application portion) as a hardware module that operates to perform certain operations as described herein.

[0276] In various embodiments, a hardware module may be implemented mechanically or electronically. For example, a hardware module may comprise dedicated circuitry or logic that is permanently configured (e.g., as a special-purpose processor, such as a field programmable gate array (FPGA) or an application-specific integrated circuit (ASIC) to perform certain operations. A hardware module may also comprise programmable logic or circuitry (e.g., as encompassed within a general-purpose processor or other programmable processor) that is temporarily configured by software to perform certain operations. It will be appreciated that the decision to implement a hardware module mechanically, in dedicated and permanently configured circuitry, or in temporarily configured circuitry (e.g., configured by software) may be driven by cost and time considerations.

[0277] Accordingly, the term "hardware module" should be understood to encompass a tangible entity, be that an entity that is physically constructed, permanently configured (e.g., hardwired), or temporarily configured (e.g., programmed) to operate in a certain manner or to perform certain operations described herein. Considering embodiments in which hardware modules are temporarily configured (e.g., programmed), each of the hardware modules need not be configured or instantiated at any one instance in time. For example, where the hardware modules comprise a general-purpose processor configured using software, the general-purpose processor may be configured as respective different hardware modules at different times. Software may accordingly configure a processor, for example, to constitute a particular hardware module at one instance of time and to constitute a different hardware module at a different instance of time.

[0278] Hardware modules can provide information to, and receive information from, other hardware modules. Accordingly, the described hardware modules may be regarded as being communicatively coupled. Where multiple of such hardware modules exist contemporaneously, communications may be achieved through signal transmission (e.g., over appropriate circuits and buses) that connect the hardware modules. In embodiments in which multiple hardware modules are configured or instantiated at different times, communications between such hardware modules may be achieved, for example, through the storage and retrieval of information in memory structures to which the multiple hardware modules have access. For example, one hardware module may perform an operation and store the output of that operation in a memory device to which it is communicatively coupled. A further hardware module may then, at a later time, access the memory device to retrieve and process the stored output. Hardware modules may also initiate communications with input or output devices, and can operate on a resource (e.g., a collection of information).

[0279] The various operations of example methods described herein may be performed, at least partially, by one or more processors that are temporarily configured (e.g., by software) or permanently configured to perform the relevant operations. Whether temporarily or permanently configured, such processors may constitute processor-implemented modules that operate to perform one or more operations or functions. The modules referred to herein may, in some example embodiments, comprise processor-implemented modules.

[0280] Similarly, the methods or routines described herein may be at least partially processor-implemented. For example, at least some of the operations of a method may be performed by one or more processors or processor-implemented hardware modules. The performance of certain of the operations may be distributed among the one or more processors, not only residing within a single machine, but deployed across a number of machines. In some example embodiments, the processor or processors may be located in a single location (e.g., within a home environment, an office environment or as a server farm), while in other embodiments the processors may be distributed across a number of locations.

[0281] The performance of certain of the operations may be distributed among the one or more processors, not only residing within a single machine, but deployed across a number of machines. In some example embodiments, the one or more processors or processor-implemented modules may be located in a single geographic location (e.g., within a home environment, an office environment, or a server farm). In other example embodiments, the one or more processors or processor-implemented modules may be distributed across a number of geographic locations.

[0282] Unless specifically stated otherwise, discussions herein using words such as "processing," "computing," "calculating," "determining," "presenting," "displaying," or the like may refer to actions or processes of a machine (e.g., a computer) that manipulates or transforms data represented as physical (e.g., electronic, magnetic, or optical) quantities within one or more memories (e.g., volatile memory, non-volatile memory, or a combination thereof), registers, or other machine components that receive, store, transmit, or display information.

[0283] As used herein any reference to "one embodiment" or "an embodiment" means that a particular element, feature, structure, or characteristic described in connection with the embodiment is included in at least one embodiment. The appearances of the phrase "in one embodiment" in various places in the specification are not necessarily all referring to the same embodiment.

[0284] Some embodiments may be described using the expression "coupled" and "connected" along with their derivatives. For example, some embodiments may be described using the term "coupled" to indicate that two or more elements are in direct physical or electrical contact. The term "coupled," however, may also mean that two or more elements are not in direct contact with each other, but yet still co-operate or interact with each other. The embodiments are not limited in this context.

[0285] As used herein, the terms "comprises," "comprising," "includes," "including," "has," "having" or any other variation thereof, are intended to cover a non-exclusive inclusion. For example, a process, method, article, or apparatus that comprises a list of elements is not necessarily limited to only those elements but may include other elements not expressly listed or inherent to such process, method, article, or apparatus. Further, unless expressly stated to the contrary, "or" refers to an inclusive or and not to an exclusive or. For example, a condition A or B is satisfied by any one of the following: A is true (or present)

and B is false (or not present), A is false (or not present) and B is true (or present), and both A and B are true (or present).

[0286] In addition, use of the "a" or "an" are employed to describe elements and components of the embodiments herein. This is done merely for convenience and to give a general sense of the description. This description, and the claims that follow, should be read to include one or at least one and the singular also includes the plural unless it is obvious that it is meant otherwise.

[0287] Although this detailed description contemplates various embodiments, it should be understood that the legal scope of the invention is defined by the words of the claims set forth at the end of this patent. This detailed description is to be construed as exemplary only and does not describe every possible embodiment, as describing every possible embodiment would be impractical, if not impossible. One could implement numerous alternate embodiments, using either current technology or technology developed after the filing date of this patent, which may fall within the scope of the claims.

[0288] It should also be understood that, unless a term is expressly defined in this patent using the sentence "As used herein, the term '_____' is hereby defined to mean . . . " or a similar sentence, there is no intent to limit the meaning of that term, either expressly or by implication, beyond its plain or ordinary meaning, and such term should not be interpreted to be limited in scope based on any statement made in any section of this patent (other than the language of the claims). To the extent that any term recited in the claims of this patent is referred to in this patent in a manner consistent with a single meaning, that is done for sake of clarity only so as to not confuse the reader, and it is not intended that such claim term be limited, by implication or otherwise, to that single meaning.

TABLE 1

(Referenced in Section 4.03)


```
<?xml version="1.0" encoding="UTF-8"?>
<acpu_journal>
  <journal_meta>
    <acpuBatchVersion>35.0</acpuBatchVersion>
    <journalCreationDate>03_14_2013_13_46_29</journalCreationDate>
  </journal_meta>
  <media bL="1" bM="1" bS="1" bXL="1" id="AGCVFF0015" p="1" t="1" xD="0"
dRM="1"/>
  <media bL="1" bM="1" bS="1" bXL="1" id="AGCVFF0170" p="1" t="1" xD="0"
dRM="1"/>
  <media bL="1" bM="1" bS="1" bXL="1" id="AGCVFF0237" p="1" t="1" xD="0"
dRM="1"/>
  <media bL="1" bM="1" bS="1" bXL="1" id="AGCVFF0187" p="1" t="1" xD="0"
dRM="1"/>
  <media bL="1" bM="1" bS="1" bXL="1" id="AGCVFF0236" p="1" t="1" xD="0"
dRM="1"/>
  <media bL="1" bM="1" bS="1" bXL="1" id="AGCVFF0234" p="1" t="1" xD="0"
dRM="1"/>
  <media bL="1" bM="1" bS="1" bXL="1" id="AGCVFF0204" p="1" t="1" xD="0"
dRM="1"/>
  <media bL="1" bM="1" bS="1" bXL="1" id="AGCVFF0017" p="1" t="1" xD="0"
dRM="1"/>
  <media bL="0" bM="1" bS="1" bXL="1" id="AGCVFF0016" p="1" t="1" xD="0"
dRM="1"/>
</acpu_journal>
```


Variables:
bL Boxart Large presence value
bM Boxart Medium presence value
bS Boxart Small presence value
bXL Boxart Extra-Large presence value
id media title
p Primary movie presence value
t Trailer presence value
xD Movie Description presence value
dRM DRM key presence value (indicates if DRM key is present on DRM server)

TABLE 2

(Referenced in section 5.01)


```
<?xml version="1.0" encoding="ISO-8859-1"?>
<video_accessories>
  <meta>
    <acpuBatchVersion>41.0</acpuBatchVersion>
    <acpuBatchDate>2013-04-18</acpuBatchDate>
  </meta>
  <accessory>
    <acpuFilePath>/mnt/drm/drm_db_1/<acpuFilePath>
    <usbFilePath>I:/drm/drm_db_1</usbFilePath>
    <fileSize>16788</fileSize>
    <fileType>DRM</fileType>
    <md5sum>332b9a79b47d7b059839fc11002c9a06</md5sum>
  </accessory>
  <accessory>
    <acpuFilePath>/mnt/application/app_1.tgz</acpuFilePath>
    <usbFilePath>I:/application/app_1.tgz</usbFilePath>
    <fileSize>16788</fileSize>
    <fileType>Application</fileType>
    <md5sum>332b9a79b47d7b059839fc11002c9a06</md5sum>
  </accessory>
  <accessory>
    <acpuFilePath>/mnt/application/app_1.tgz.md5</acpuFilePath>
    <usbFilePath>I:/application/app_1.tgz.md5</usbFilePath>
    <fileSize>16788</fileSize>
    <fileType>Checksum</fileType>
    <md5sum>332b9a79b47d7b059839fc11002c9a06</md5sum>
  </accessory>
```

TABLE 2-continued

(Referenced in section 5.01)


```
<accessory>
  <acpuFilePath>/mnt/configuration/dal_conf_1.tgz</acpuFilePath>
  <usbFilePath>I:/configuration/dal_conf_1.tgz</usbFilePath>
  <fileSize>16788</fileSize>
  <fileType>Configuration</fileType>
  <md5sum>332b9a79b47d7b059839fc11002c9a06</md5sum>
</accessory>
<accessory>
  <acpuFilePath>/mnt/configuration/dal_conf_1.tgz. md5</
acpuFilePath>
  <usbFilePath>I:/configuration/dal_conf_1.tgz.md5</usbFilePath>
  <fileSize>16788</fileSize>
  <fileType>Checksum</fileType>
  <md5sum>332b9a79b47d7b059839fc11002c9a06</md5sum>
</accessory>
<accessory>
  <acpuFilePath>/mnt/properties/current.properties</acpuFilePath>
  <usbFilePath>I:/properties/current.properties</usbFilePath>
  <fileSize>16788</fileSize>
  <fileType>Properties</fileType>
  <md5sum>332b9a79b47d7b059839fc11002c9a06</md5sum>
</accessory>
<accessory>
  <acpuFilePath>/mnt/properties/current.properties.md5</acpuFilePath>
  <usbFilePath>I:/properties/current.properties.md5</usbFilePath>
  <fileSize>16788</fileSize>
  <fileType>Checksum</fileType>
  <md5sum>332b9a79b47d7b059839fc11002c9a06</md5sum>
</accessory>
<accessory>
  <acpuFilePath>/mnt/p_k/ats_key.jks</acpuFilePath>
  <usbFilePath>I:/p_k/ats_keys.jks</usbFilePath>
  <fileSize>16788</fileSize>
  <fileType>PK</fileType>
  <md5sum>332b9a79b47d7b059839fc11002c9a06</md5sum>
</accessory>
</video_accessories>
```


What is claimed is:

1. A system for providing an in-vehicle content-delivery service to mobile consumer devices, the system comprising:

a content delivery system disposed at a vehicle, the content delivery system including:

one or more processors;

one or more communication interfaces that are coupled to the one or more processors and that are configured to: (i) communicatively couple the content delivery system to one or more mobile consumer devices via an in-vehicle network for the vehicle, and (ii) communicatively couple the content delivery system to a license server that is external to the vehicle and that is configured to authorize or not authorize content-requests originating from the one or more mobile consumer devices; and

one or more memories coupled to the one or more processors and storing instructions that, when executed by the one or more processors, cause the content delivery system to:

(i) detect a loss of a connection between the content delivery system and the license server;

(ii) respond to the detected loss by operating as a proxy for the license server, including performing an authorization operation to determine a particular content-request from a particular mobile consumer device is authorized; and

(iii) transmit content to the particular mobile consumer device in response to determining that the particular content-request from the particular mobile consumer device is authorized.

2. The system of claim **1**, wherein performing the authorization operation includes analyzing a unique user identifier for the particular content-request and determining that the particular content-request is authorized based on the unique user identifier.

3. The system of claim **1**, wherein the vehicle is an aircraft, and wherein the license server is a ground-based server configured to communicatively connect to the in-vehicle network via an air-to-ground communication link.

4. The system of claim **1**, wherein performing the authorization operation includes determining whether or not a token was issued to the particular mobile consumer device by the license server prior to the loss of connection, wherein the token indicates that the particular mobile consumer device or a particular user associated with the mobile consumer device is authorized to access the content associated with the particular content-request.

5. The system of claim **1**, wherein performing the authorization operation includes processing payment information for the particular content-request to determine a payment has been made for the particular content-request.

6. The system of claim **5**, wherein the instructions further cause the content delivery system to update license-data stored at a memory disposed at the vehicle to indicate that the particular mobile consumer device has been granted access rights for the content item.

7. The system of claim **1**, wherein performing the authorization operation includes receiving and storing payment information for the particular content-request without processing the payment information.

8. The system of claim **1**, wherein the instructions further cause the content delivery system to detect a re-establishment of the connection and to respond to the detected re-establishment by: (i) synchronizing with the license server and (ii) ceasing operating as the proxy for the license server.

9. The system of claim **1**, wherein the content is encrypted when transmitted to the particular mobile consumer device; and

wherein the instructions further cause the content delivery system to transmit to the particular mobile consumer device a key for decrypting the content.

10. The system of claim **9**, wherein the key is configured to decrypt the content for a temporary interval.

11. A method for providing an in-vehicle content-delivery service to mobile consumer devices, the method comprising:

implementing, at a vehicle, an in-vehicle content delivery system that is configured to: (i) communicatively couple to one or more mobile consumer devices via an in-vehicle network for the vehicle and (ii) communicatively couple to a license server that is external to the vehicle and that is configured to authorize or not authorize content-requests originating from the one or more mobile consumer devices;

detecting a loss of a connection between the in-vehicle content delivery system and the license server;

responding to the detected loss by operating the in-vehicle content delivery system as a proxy for the license server, including performing, at the in-vehicle content delivery system, an authorization operation to determine a particular content-request from a particular mobile consumer device is authorized; and

transmitting content to the particular mobile consumer device in response to the in-vehicle content delivery system determining that the particular content-request from the particular mobile consumer device is authorized.

12. The method of claim **11**, wherein performing the authorization operation includes analyzing a unique user identifier for the particular content-request and determining that the particular content-request is authorized based on the unique user identifier.

13. The method of claim **11**, wherein the vehicle is an aircraft, and wherein the license server is a ground-based server configured to communicatively connect to the in-vehicle network via an air-to-ground communication link.

14. The method of claim **11**, wherein performing the authorization operation includes determining whether or not a token was issued to the particular mobile consumer device by the license server prior to the loss of connection, wherein the token indicates that the particular mobile consumer device or a particular user associated with the mobile consumer device is authorized to access the content associated with the particular content-request.

15. The method of claim **11**, wherein performing the authorization operation includes processing payment information for the particular content-request to determine a payment has been made for the particular content-request.

16. The method of claim **11**, wherein performing the authorization operation includes receiving and storing payment information for the particular content-request without processing the payment information.

17. The method of claim **15**, further comprising updating license-data stored at a memory disposed at the vehicle to indicate that the particular mobile consumer device has been granted temporary access rights for the content item.

18. The method of claim **1**, further comprising detecting a re-establishment of the connection and responding to the detected re-establishment in a manner that includes: (i) synchronizing the in-vehicle content delivery system with the license server and (ii) ceasing operating the in-vehicle content delivery system as the proxy for the license server.

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

encrypting the content before transmitting the content to the particular mobile consumer device; and

transmitting to the particular mobile consumer device a key for decrypting the content.

20. The method of claim **19**, wherein the key is configured to decrypt the content for a temporary interval.

* * * * *