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(54) METHOD AND APPARATUS FOR PROVIDING CONTENT USING EDGE COMPUTING SERVICE

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(57) **ABSTRACT**

Provided are a method and apparatus for providing content using an edge computing service. A method, performed by an edge data network, of providing a streaming service to a terminal includes caching a plurality of content related to the streaming service; receiving, from the terminal, a message for requesting content list information corresponding to the terminal; determining the content list information corresponding to the terminal from the cached plurality of content, based on the message for requesting the content list information; transmitting the determined content list information to the terminal; receiving, from the terminal, a playback request message for at least one content selected based on the content list information; and providing, to the terminal, data about the at least one content, based on the playback request message.

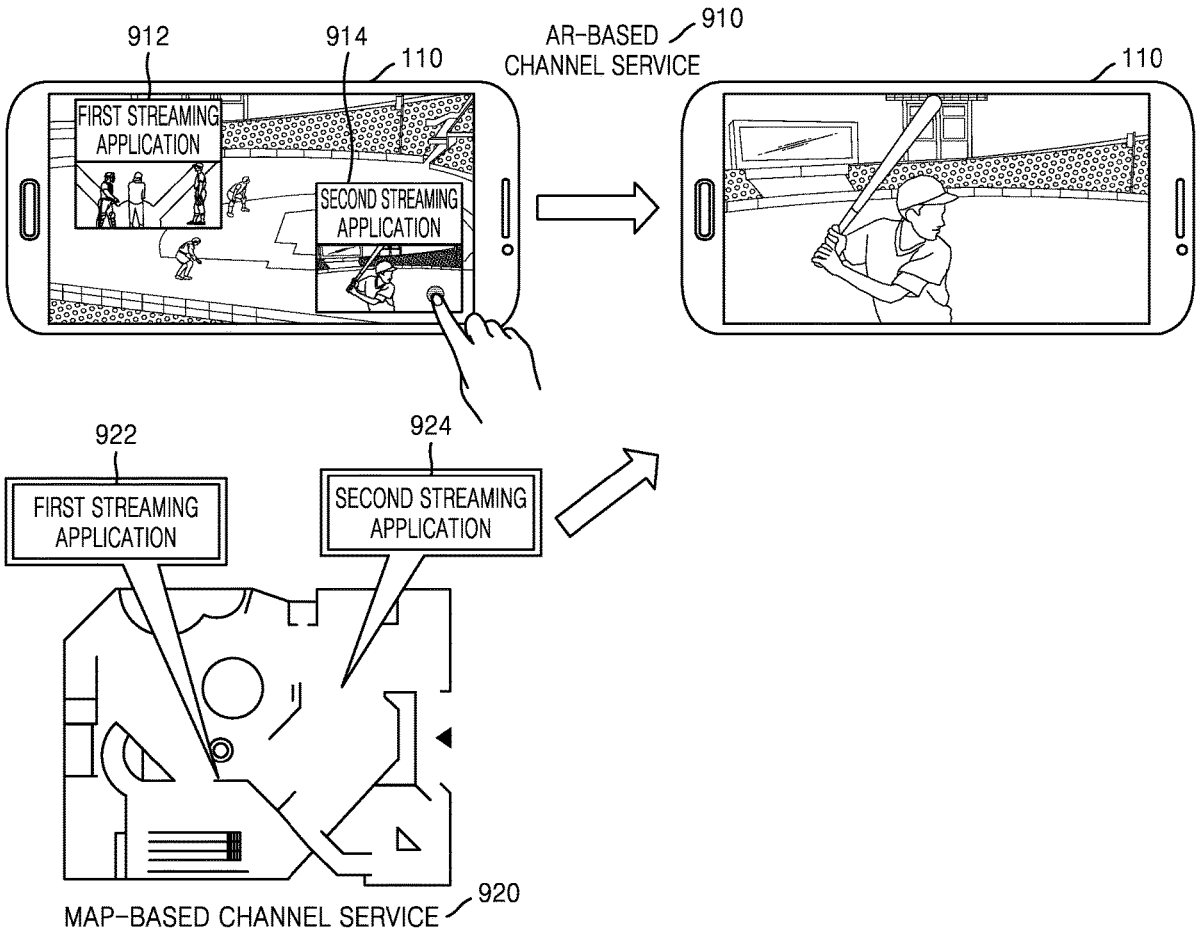


FIG. 1

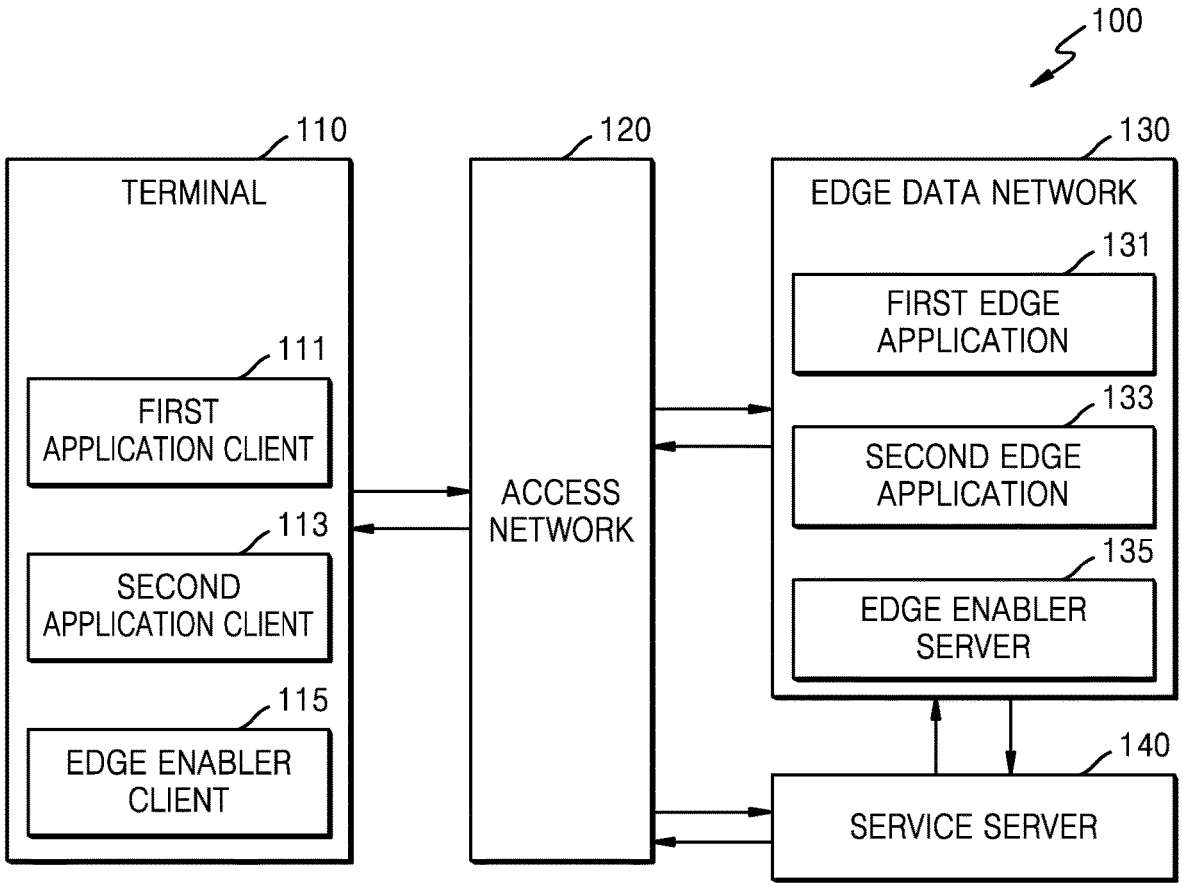

100
110
TERMINAL
111
FIRST APPLICATION CLIENT
113
SECOND APPLICATION CLIENT
115
EDGE ENABLER CLIENT
120
ACCESS NETWORK
130
EDGE DATA NETWORK
131
FIRST EDGE APPLICATION
133
SECOND EDGE APPLICATION
135
EDGE ENABLER SERVER
140
SERVICE SERVER

FIG. 2

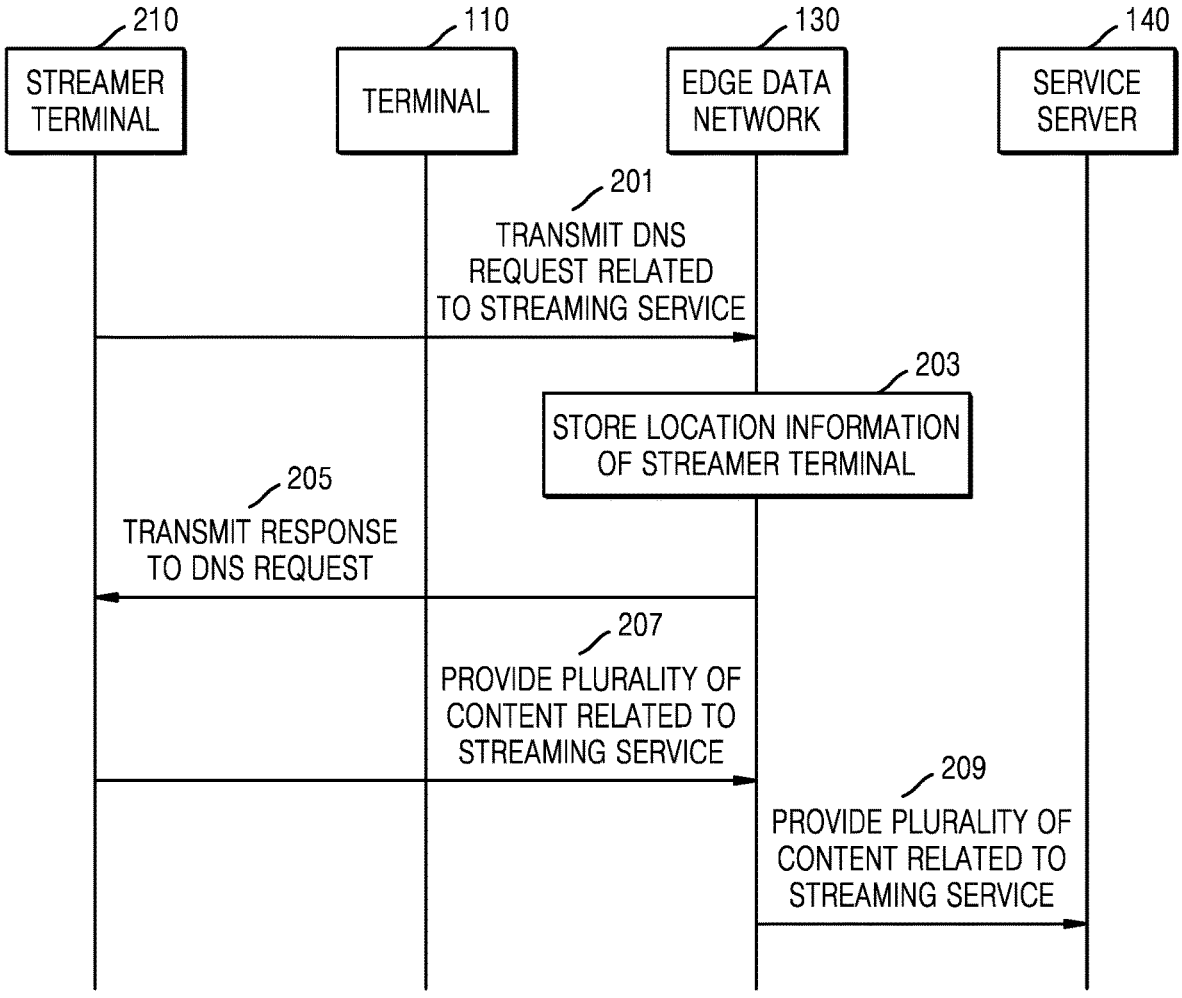

210
STREAMER TERMINAL
110
TERMINAL
130
EDGE DATA NETWORK
140
SERVICE SERVER
201
TRANSMIT DNS REQUEST RELATED TO STREAMING SERVICE
203
STORE LOCATION INFORMATION OF STREAMER TERMINAL
205
TRANSMIT RESPONSE TO DNS REQUEST
207
PROVIDE PLURALITY OF CONTENT RELATED TO STREAMING SERVICE
209
PROVIDE PLURALITY OF CONTENT RELATED TO STREAMING SERVICE

FIG. 3

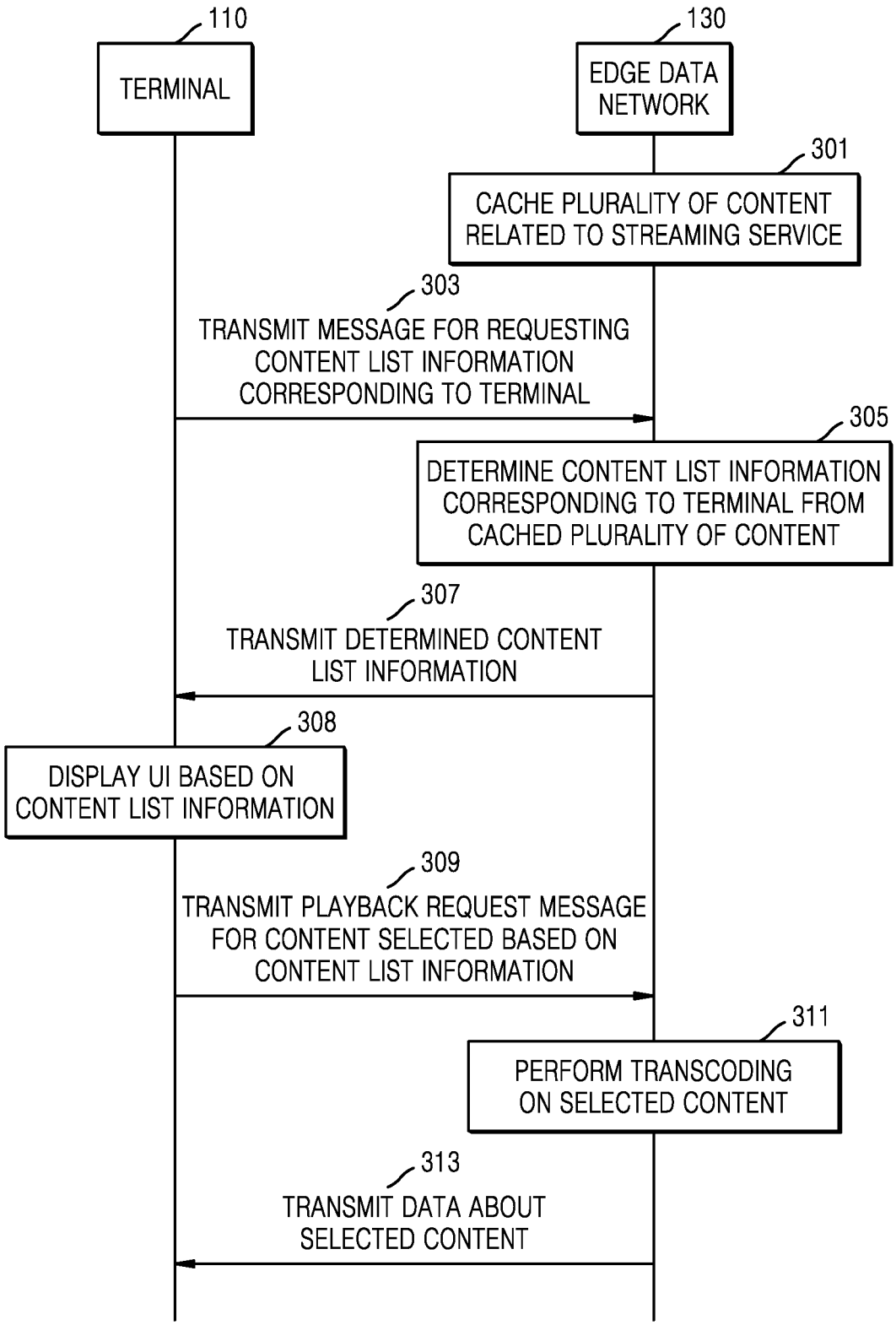

110
TERMINAL
130
EDGE DATA NETWORK
301
CACHE PLURALITY OF CONTENT RELATED TO STREAMING SERVICE
303
TRANSMIT MESSAGE FOR REQUESTING CONTENT LIST INFORMATION CORRESPONDING TO TERMINAL
305
DETERMINE CONTENT LIST INFORMATION CORRESPONDING TO TERMINAL FROM CACHED PLURALITY OF CONTENT
307
TRANSMIT DETERMINED CONTENT LIST INFORMATION
308
DISPLAY UI BASED ON CONTENT LIST INFORMATION
309
TRANSMIT PLAYBACK REQUEST MESSAGE FOR CONTENT SELECTED BASED ON CONTENT LIST INFORMATION
311
PERFORM TRANSCODING ON SELECTED CONTENT
313
TRANSMIT DATA ABOUT SELECTED CONTENT

FIG. 4

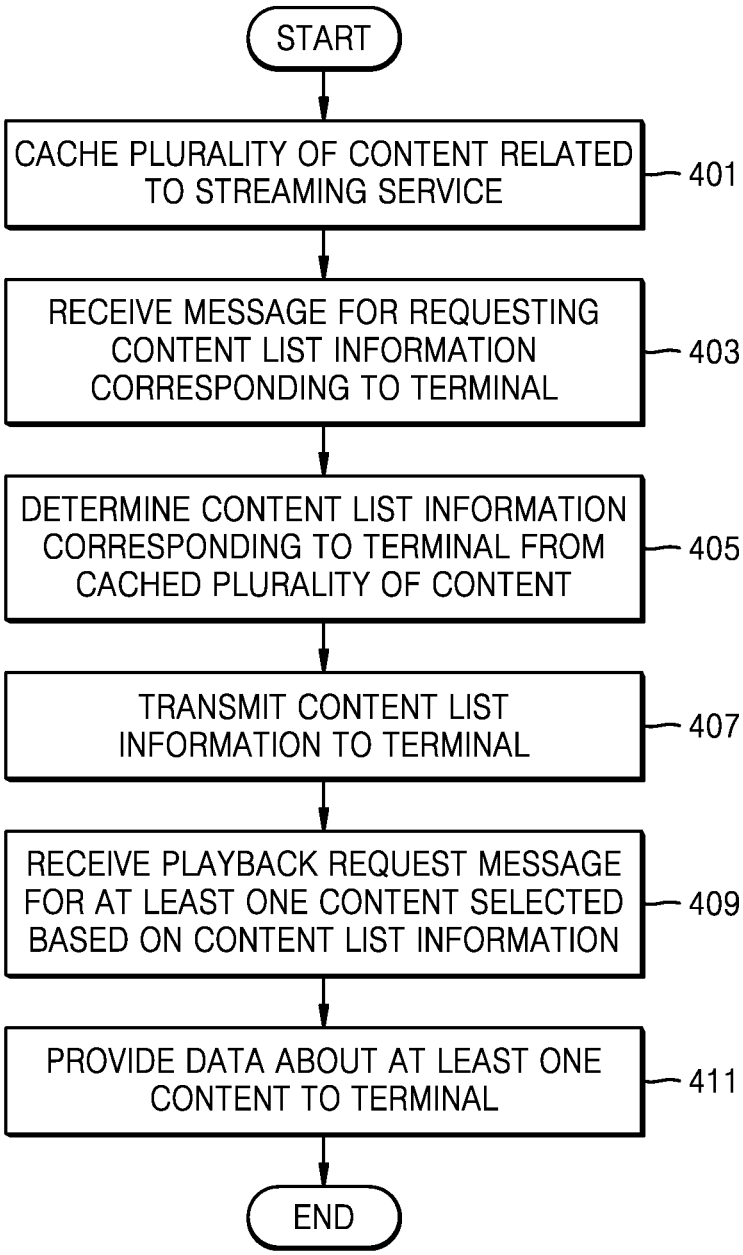

START
CACHE PLURALITY OF CONTENT RELATED TO STREAMING SERVICE
401
RECEIVE MESSAGE FOR REQUESTING CONTENT LIST INFORMATION CORRESPONDING TO TERMINAL
403
DETERMINE CONTENT LIST INFORMATION CORRESPONDING TO TERMINAL FROM CACHED PLURALITY OF CONTENT
405
TRANSMIT CONTENT LIST INFORMATION TO TERMINAL
407
RECEIVE PLAYBACK REQUEST MESSAGE FOR AT LEAST ONE CONTENT SELECTED BASED ON CONTENT LIST INFORMATION
409
PROVIDE DATA ABOUT AT LEAST ONE CONTENT TO TERMINAL
411
END

FIG. 5

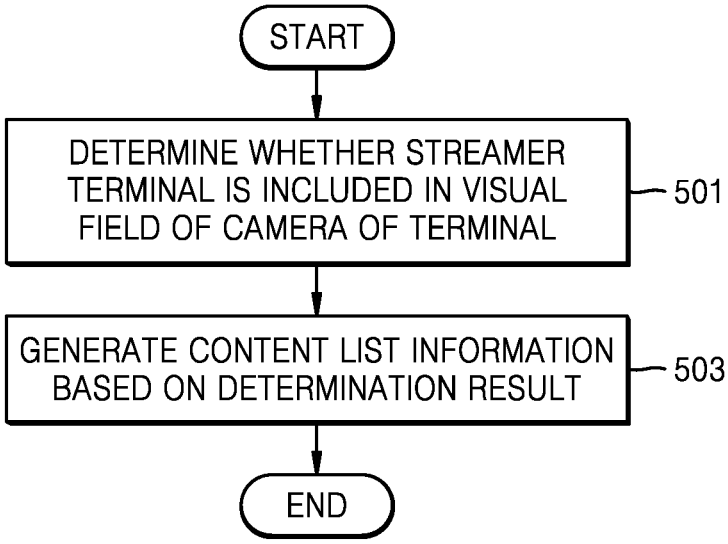

START
DETERMINE WHETHER STREAMER TERMINAL IS INCLUDED IN VISUAL FIELD OF CAMERA OF TERMINAL
501
GENERATE CONTENT LIST INFORMATION BASED ON DETERMINATION RESULT
503
END

FIG. 6

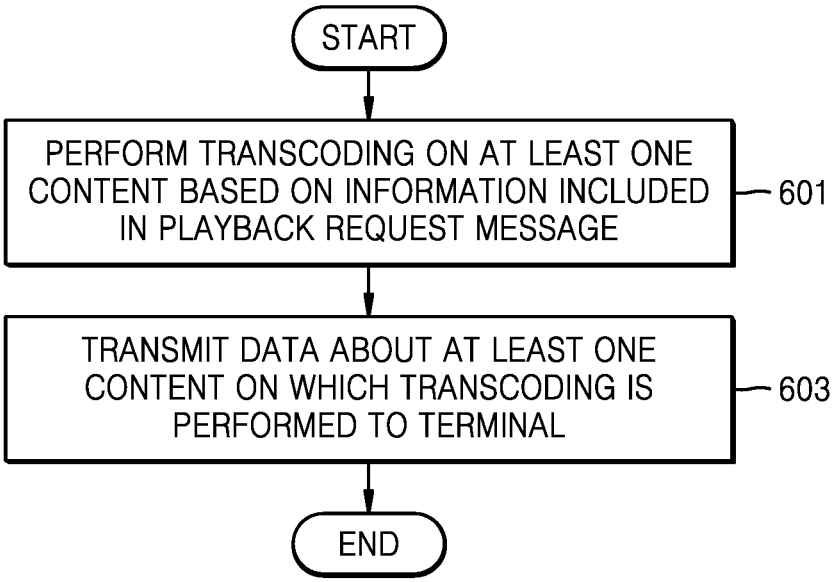

START
PERFORM TRANSCODING ON AT LEAST ONE CONTENT BASED ON INFORMATION INCLUDED IN PLAYBACK REQUEST MESSAGE
601
TRANSMIT DATA ABOUT AT LEAST ONE CONTENT ON WHICH TRANSCODING IS PERFORMED TO TERMINAL
603
END

FIG. 7

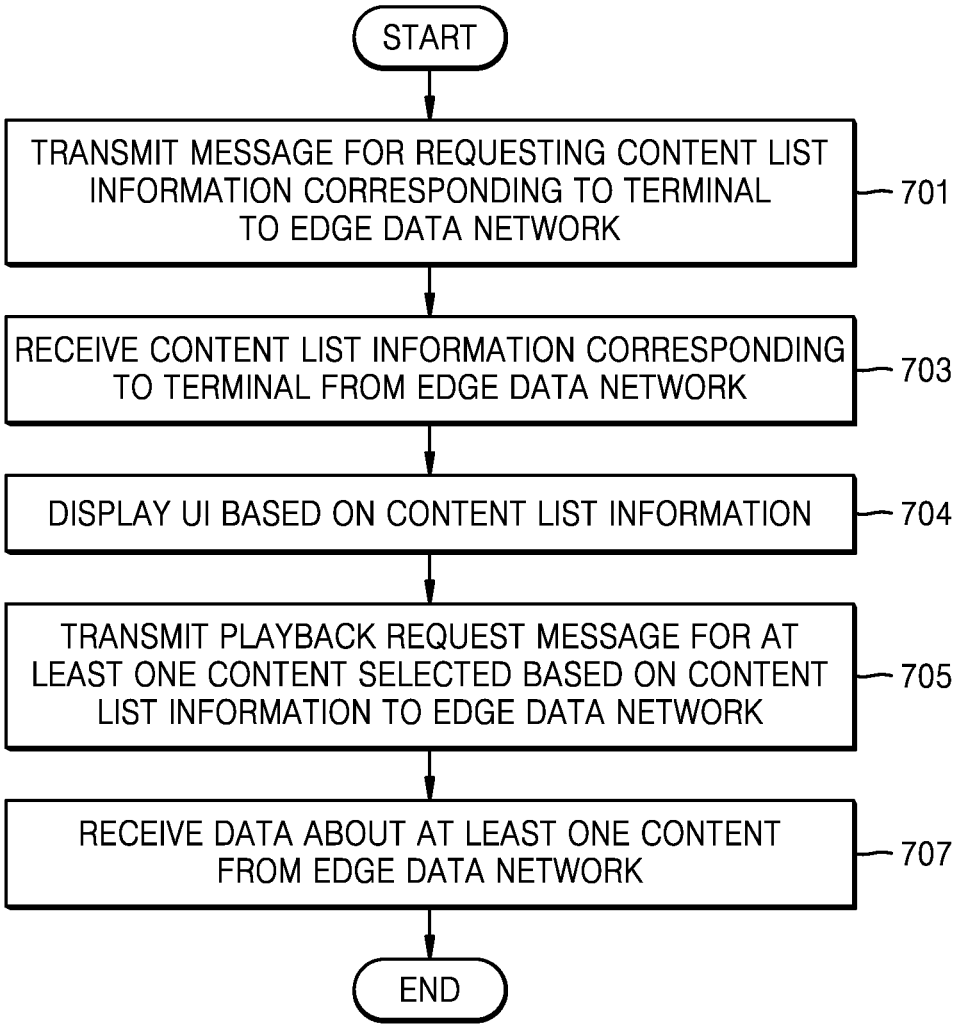

START
TRANSMIT MESSAGE FOR REQUESTING CONTENT LIST INFORMATION CORRESPONDING TO TERMINAL TO EDGE DATA NETWORK
701
RECEIVE CONTENT LIST INFORMATION CORRESPONDING TO TERMINAL FROM EDGE DATA NETWORK
703
DISPLAY UI BASED ON CONTENT LIST INFORMATION
704
TRANSMIT PLAYBACK REQUEST MESSAGE FOR AT LEAST ONE CONTENT SELECTED BASED ON CONTENT LIST INFORMATION TO EDGE DATA NETWORK
705
RECEIVE DATA ABOUT AT LEAST ONE CONTENT FROM EDGE DATA NETWORK
707
END

FIG. 8

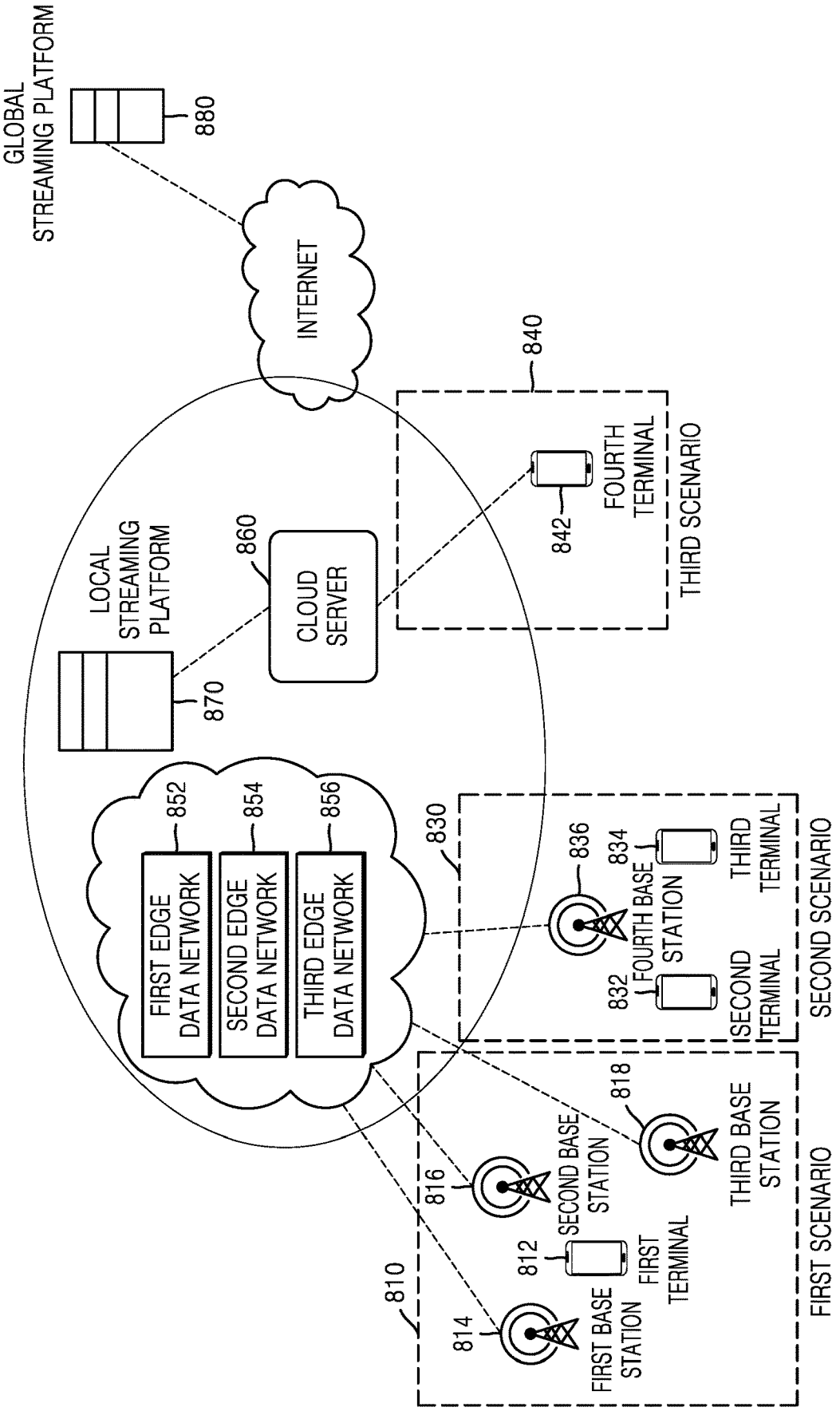

GLOBAL STREAMING PLATFORM
880
INTERNET
840
FOURTH TERMINAL
842
THIRD SCENARIO
LOCAL STREAMING PLATFORM
870
860
CLOUD SERVER
FIRST EDGE DATA NETWORK
852
SECOND EDGE DATA NETWORK
854
THIRD EDGE DATA NETWORK
856
830
836
834
FOURTH BASE STATION
THIRD TERMINAL
832
SECOND TERMINAL
SECOND SCENARIO
818
THIRD BASE STATION
816
SECOND BASE STATION
812
FIRST TERMINAL
810
814
FIRST BASE STATION
FIRST SCENARIO

FIG. 9

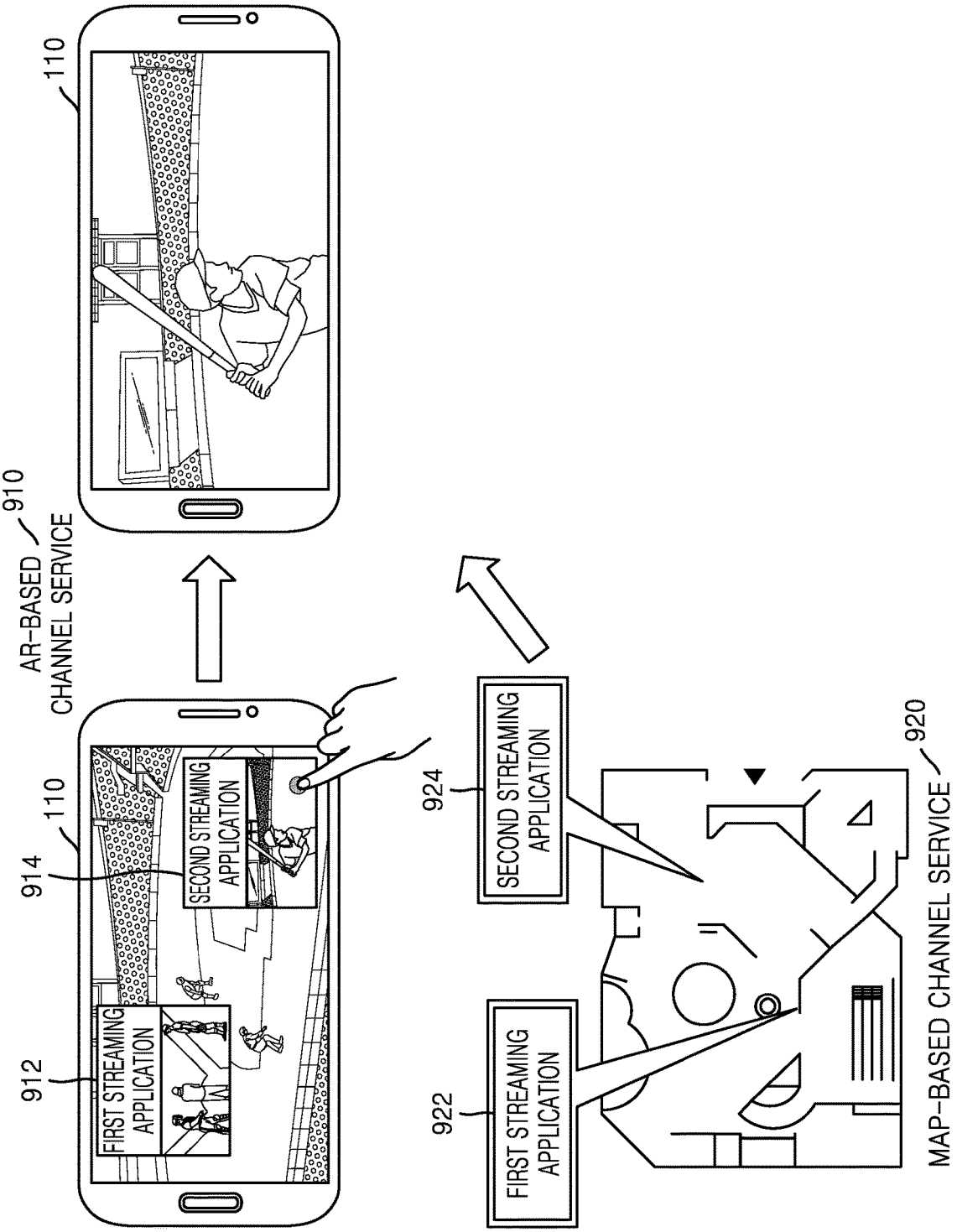
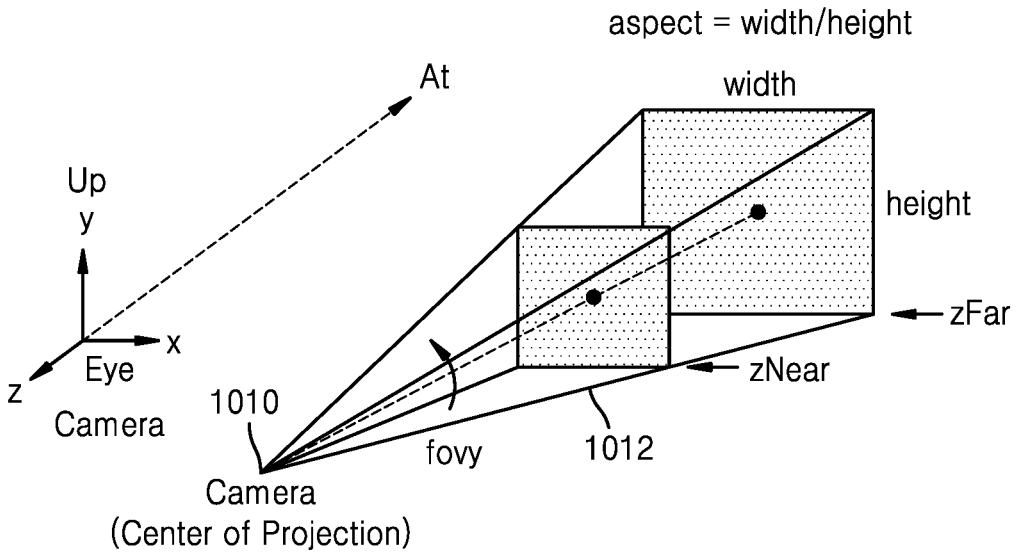

AR-BASED CHANNEL SERVICE
910
110
912
FIRST STREAMING APPLICATION
914
SECOND STREAMING APPLICATION
922
FIRST STREAMING APPLICATION
924
SECOND STREAMING APPLICATION
MAP-BASED CHANNEL SERVICE
920

FIG. 10


aspect = width/height
At
width
Up
y
height
zFar
x
Eye
z
zNear
Camera
1010
fovy
1012
Camera
(Center of Projection)

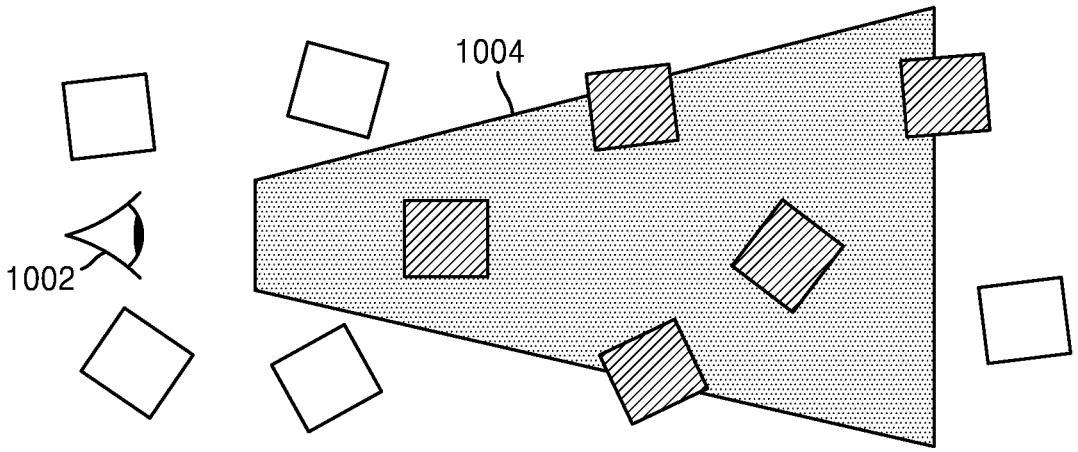

1004
1002

FIG. 11

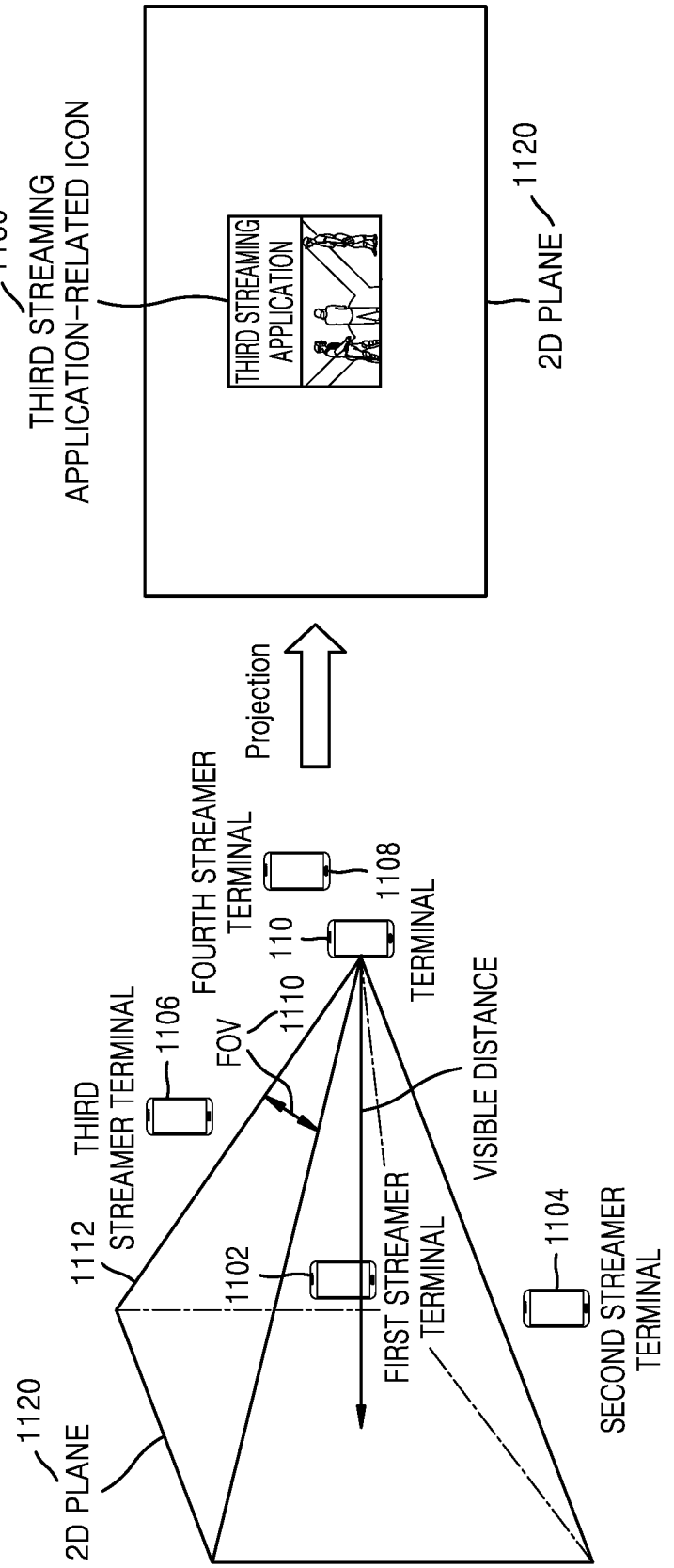

1130
THIRD STREAMING APPLICATION-RELATED ICON
THIRD STREAMING APPLICATION
1120
2D PLANE
Projection
FOURTH STREAMER TERMINAL
1108
110
1110
FOV
1106
THIRD STREAMER TERMINAL
1112
1102
FIRST STREAMER TERMINAL
VISIBLE DISTANCE
1104
SECOND STREAMER TERMINAL
1120
2D PLANE

FIG. 12

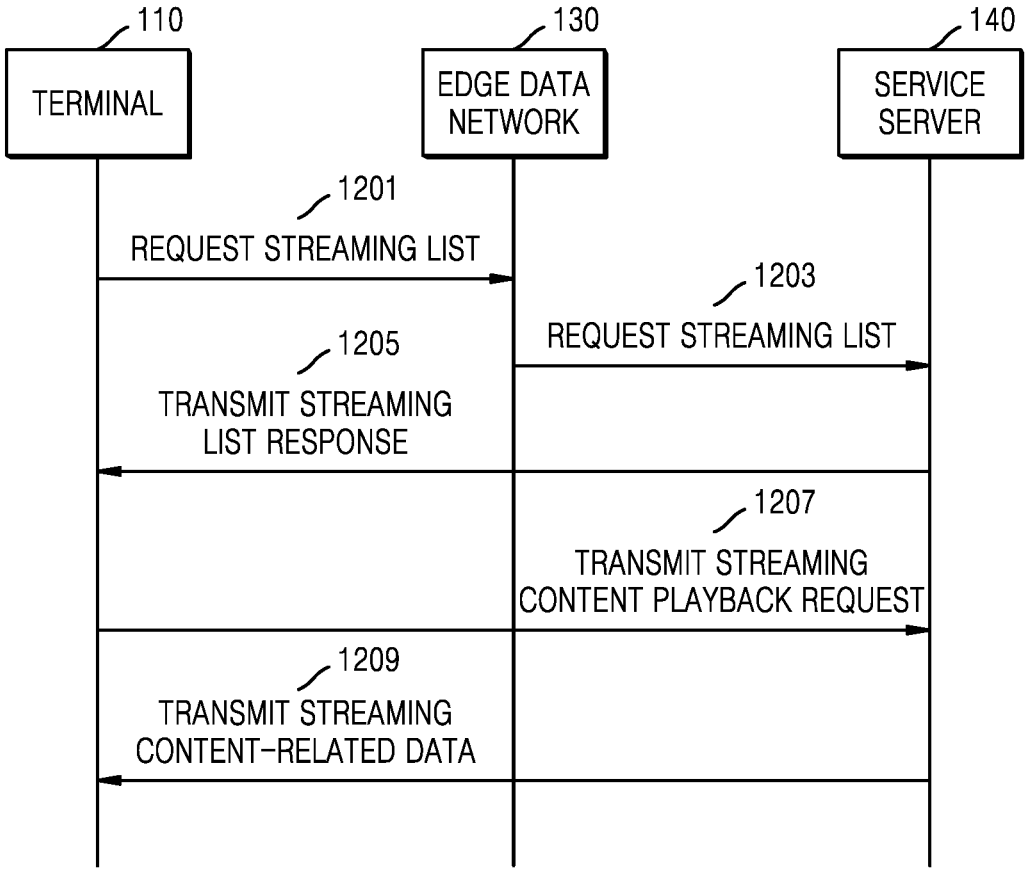

110
TERMINAL
130
EDGE DATA NETWORK
140
SERVICE SERVER
1201
REQUEST STREAMING LIST
1203
REQUEST STREAMING LIST
1205
TRANSMIT STREAMING LIST RESPONSE
1207
TRANSMIT STREAMING CONTENT PLAYBACK REQUEST
1209
TRANSMIT STREAMING CONTENT-RELATED DATA

FIG. 13

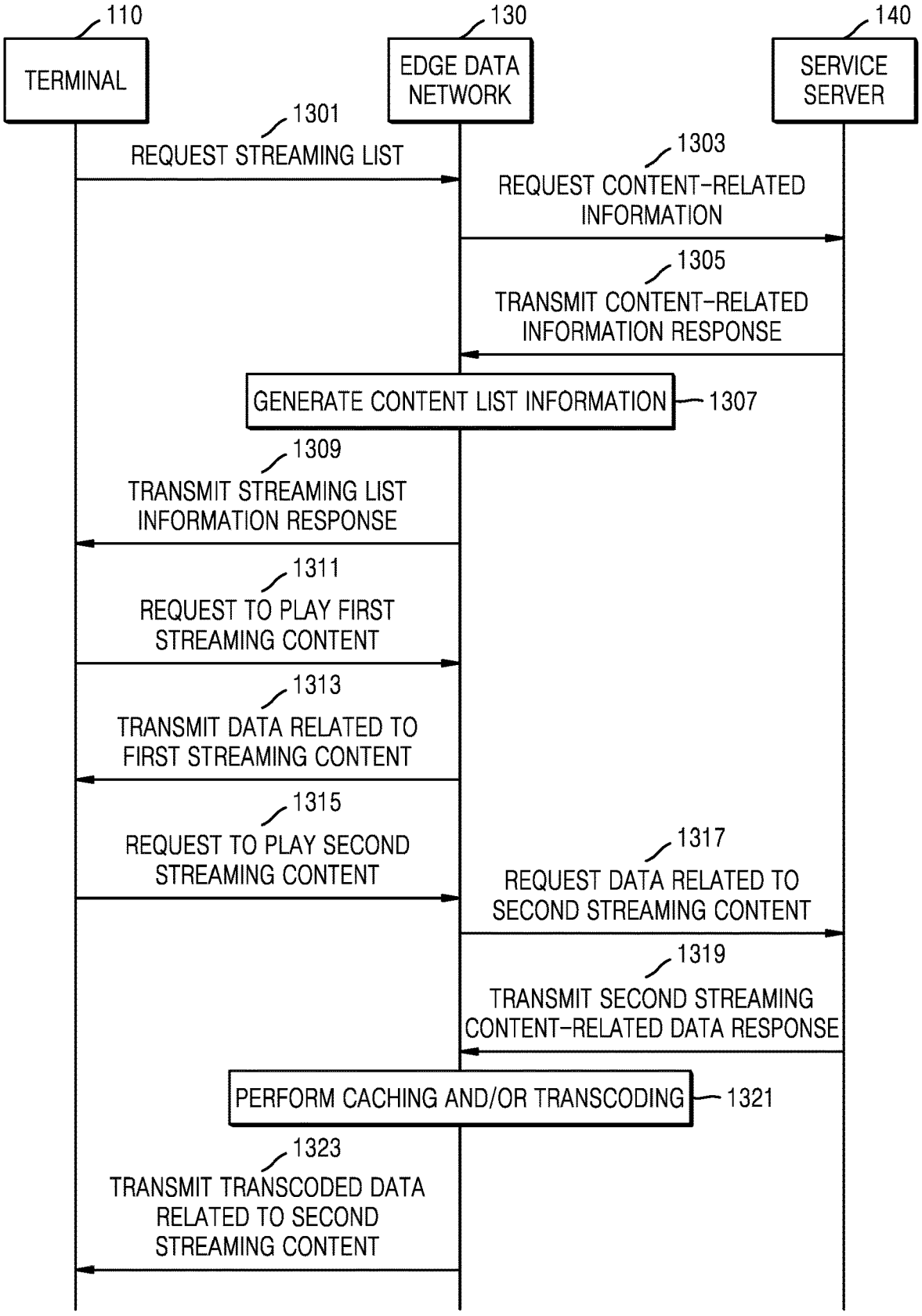

110
TERMINAL
130
EDGE DATA NETWORK
140
SERVICE SERVER
1301
REQUEST STREAMING LIST
1303
REQUEST CONTENT-RELATED INFORMATION
1305
TRANSMIT CONTENT-RELATED INFORMATION RESPONSE
GENERATE CONTENT LIST INFORMATION
1307
1309
TRANSMIT STREAMING LIST INFORMATION RESPONSE
1311
REQUEST TO PLAY FIRST STREAMING CONTENT
1313
TRANSMIT DATA RELATED TO FIRST STREAMING CONTENT
1315
REQUEST TO PLAY SECOND STREAMING CONTENT
1317
REQUEST DATA RELATED TO SECOND STREAMING CONTENT
1319
TRANSMIT SECOND STREAMING CONTENT-RELATED DATA RESPONSE
PERFORM CACHING AND/OR TRANSCODING
1321
1323
TRANSMIT TRANSCODED DATA RELATED TO SECOND STREAMING CONTENT

FIG. 14

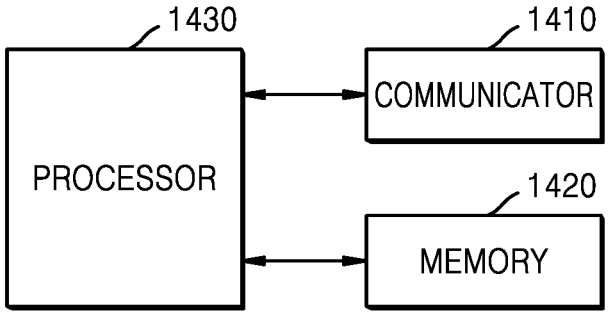
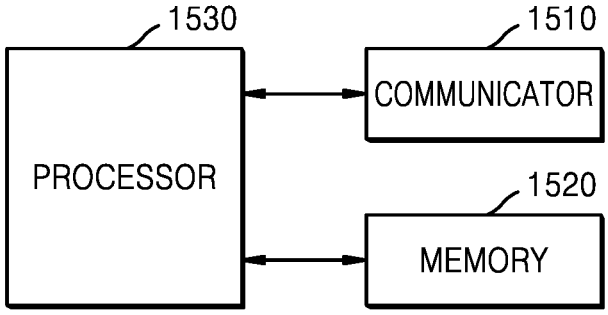

1430
1410
PROCESSOR
COMMUNICATOR
1420
MEMORY

FIG. 15


1530
1510
PROCESSOR
COMMUNICATOR
1520
MEMORY

METHOD AND APPARATUS FOR PROVIDING CONTENT USING EDGE COMPUTING SERVICE

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application is based on and claims priority under 35 U.S.C. § 119 to Korean Patent Application No. 10-2019-0134098, filed on Oct. 25, 2019, in the Korean Intellectual Property Office, the disclosure of which is incorporated by reference herein in its entirety.

BACKGROUND

1. Field

[0002] The disclosure relates to an edge computing service (e.g., a multi-access edge computing (MEC) service), and for example, to a method and apparatus for providing content using an edge computing service.

2. Description of Related Art

[0003] Recently, edge computing technology for transmitting data using an edge server has been discussed. Edge computing technology may include, for example, multi-access edge computing (MEC) or fog computing (FOC). Edge computing technology may refer to technology of providing data to an electronic device through a separate server (hereinafter, an 'edge data network' or a 'MEC server') provided at a location geographically close to the electronic device, for example, inside or near a base station. For example, an application requiring a low latency from among at least one application installed in the electronic device may transmit or receive data through an edge server provided at a geographically close location instead of a server located in an external data network (DN) (e.g., the Internet).

[0004] Recently, a service using edge computing technology (hereinafter, referred to as a 'MEC-based service' or a 'MEC service') has been discussed and research on and development of an electronic device are being conducted to support the MEC-based service. For example, an application of the electronic device may transmit or receive edge computing-based data on an application layer to or from an edge server (or an application of the edge server).

[0005] As research and development for supporting a MEC-based service are being conducted, methods for efficiently providing a MEC-based streaming service are being discussed.

SUMMARY

[0006] Embodiments of the disclosure provide a method and apparatus for providing content using an edge computing service, based on the aforementioned discussion.

[0007] Embodiments of the disclosure provide a method and apparatus for providing a multi-access edge computing (MEC)-based streaming service.

[0008] Embodiments of the disclosure provide a method and apparatus for providing a real time streaming service to a terminal connected to an edge data network.

[0009] Embodiments of the disclosure provide a method and apparatus for providing an effective real time broadcast channel search service.

[0010] Embodiments of the disclosure provide a method and apparatus for providing content related to a streaming service, using augmented reality (AR).

[0011] Additional aspects will be set forth in part in the description which follows and, in part, will be apparent from the description.

[0012] According to an example embodiment of the disclosure, a method, performed by an edge data network, of providing a streaming service to a terminal includes: caching a plurality of content related to the streaming service; receiving, from the terminal, a message for requesting content list information corresponding to the terminal; determining the content list information corresponding to the terminal from the cached plurality of content, based on the message for requesting the content list information; transmitting the determined content list information to the terminal; receiving, from the terminal, a playback request message for at least one content selected based on the content list information; and providing, to the terminal, data about the at least one content, based on the playback request message.

[0013] According to an example embodiment of the disclosure, an operating method of a terminal for receiving a streaming service from an edge data network includes: transmitting, to the edge data network, a message for requesting content list information corresponding to the terminal; receiving, from the edge data network, the content list information corresponding to the terminal determined from a plurality of cached content related to the streaming service; transmitting, to the edge data network, a playback request message for at least one content selected based on the content list information; and receiving data about the at least one content, from the edge data network.

[0014] According to an example embodiment of the disclosure, an edge data network for providing a streaming service to a terminal includes: a communicator; a memory configured to store a plurality of instructions; and a processor configured to execute the plurality of instructions to cache a plurality of content related to the streaming service, receive, from the terminal, a message for requesting content list information corresponding to the terminal, determine the content list information corresponding to the terminal, from the cached plurality of content, based on the message for requesting the content list information, transmit the determined content list information to the terminal, receive, from the terminal, a playback request message for at least one content selected based on the content list information, and provide, to the terminal, data about the at least one content, based on the playback request message.

[0015] According to an example embodiment of the disclosure, a terminal for receiving a streaming service from an edge data network includes: a communicator; a memory configured to store a plurality of instructions; and a processor configured to execute the plurality of instructions to transmit, to the edge data network, a message for requesting content list information corresponding to the terminal, receive, from the edge data network, the content list information corresponding to the terminal determined from a plurality of cached content related to the streaming service, transmit, to the edge data network, a playback request message for at least one content selected based on the content list information, and receive data about the at least one content, from the edge data network.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016] The above and other aspects, features, and advantages of certain embodiments of the present disclosure will be more apparent from the following detailed description, taken in conjunction with the accompanying drawings, in which:

[0017] FIG. **1** is a block diagram illustrating an example multi-access edge computing (MEC) technology in a network environment, according to various embodiments;

[0018] FIG. **2** is a signal flow diagram illustrating an example operating procedure of a plurality of apparatuses for providing a MEC-based streaming service, according to various embodiments;

[0019] FIG. **3** is a signal flow diagram illustrating an example operating procedure between an edge data network and a terminal for providing a MEC-based streaming service, according to various embodiments;

[0020] FIG. **4** is a flowchart illustrating an example operating method of an edge data network, according to various embodiments;

[0021] FIG. **5** is a flowchart illustrating an example operating method of an edge data network for determining content list information according to various embodiments;

[0022] FIG. **6** is a flowchart illustrating an example operating method of an edge data network for performing transcoding on content, according to various embodiments;

[0023] FIG. **7** is a flowchart illustrating an example operating method of a terminal, according to various embodiments;

[0024] FIG. **8** is a diagram illustrating example scenarios of providing a streaming service according to various embodiments;

[0025] FIG. **9** is a diagram illustrating an example of providing a streaming service according to various embodiments;

[0026] FIG. **10** is a diagram illustrating an example method used to generate content list information, according to various embodiments;

[0027] FIG. **11** is a diagram illustrating an example method of generating content list information using augmented reality (AR), according to various embodiments;

[0028] FIG. **12** is a signal flow diagram illustrating an example procedure of providing content related to a streaming service, according to various embodiments;

[0029] FIG. **13** is a signal flow diagram illustrating an example procedure of providing content related to a streaming service, according to various embodiments;

[0030] FIG. **14** is a block diagram illustrating an example configuration of an edge data network according to various embodiments; and

[0031] FIG. **15** is a block diagram illustrating an example configuration of a terminal according to various embodiments.

DETAILED DESCRIPTION

[0032] Hereinafter, various example embodiments of the disclosure will be described in greater detail with reference to the accompanying drawings.

[0033] While describing embodiments of the disclosure, descriptions of techniques that are well known in the art and not directly related to the disclosure may be omitted for clarity.

[0034] Some elements in the attached drawings may be exaggerated, omitted, or schematically illustrated. Also, the size of each component does not completely reflect the actual size of the element. In the drawings, the same or corresponding elements are denoted by the same reference numerals.

[0035] The advantages and features of the disclosure and methods of achieving them will become apparent with reference to example embodiments of the disclosure described in detail below along with the attached drawings. The disclosure may, however, be embodied in many different forms and should not be construed as limited to embodiments of the disclosure set forth herein; rather these embodiments of the disclosure are illustrative, not limiting, and will convey the scope of the disclosure to one of ordinary skill in the art. In the disclosure, the same reference numerals denote the same elements.

[0036] Throughout the disclosure, the expression "at least one of a, b or c" indicates only a, only b, only c, both a and b, both a and c, both b and c, all of a, b, and c, or variations thereof.

[0037] A terminal may include a user equipment (UE), a mobile station (MS), a cellular phone, a smartphone, a computer, or a multimedia system capable of performing a communication function.

[0038] In the disclosure, a controller may also be referred to as a processor.

[0039] In the disclosure, a layer (or a layer apparatus) may also be referred to as an entity.

[0040] It will be understood that each block of flowchart illustrations and combinations of blocks in the flowchart illustrations may be implemented by computer program instructions. Because these computer program instructions may be loaded into a processor of a general-purpose computer, special purpose computer, or other programmable data processing apparatus, the instructions, which are executed via the processor of the computer or other programmable data processing apparatus, generate means for implementing the functions specified in the flowchart block(s). Because these computer program instructions may also be stored in a computer usable or computer-readable memory that may direct a computer or other programmable data processing apparatus to function in a particular manner, the instructions stored in the computer usable or computer-readable memory may produce an article of manufacture including instruction means that implement the functions specified in the flowchart block(s). Because the computer program instructions may also be loaded onto a computer or other programmable data processing apparatus, a series of operational steps may be performed on the computer or other programmable apparatus to produce a computer implemented process, and thus the instructions executed on the computer or other programmable apparatus may provide steps for implementing the functions specified in the flowchart block(s).

[0041] In addition, each block of the flowchart illustrations may represent a module, segment, or portion of code, which includes one or more executable instructions for implementing the specified logical function(s). It should also be noted that in some alternative implementations, the functions noted in the blocks may occur out of the order. For example, two blocks shown in succession may in fact be executed substantially concurrently or the blocks may sometimes be executed in the reverse order, depending upon the functionality involved.

[0042] The term "~ unit" used in the present embodiment of the disclosure may refer, for example, to a software or hardware component, such as a field-programmable gate array (FPGA) or an application-specific integrated circuit (ASIC), which performs certain tasks. However, "~ unit" is not limited to software or hardware. The "~ unit" may be configured to be in an addressable storage medium or configured to operate one or more processors. Thus, "~ unit" may include, by way of example, components, such as software components, object-oriented software components, class components, and task components, processes, functions, attributes, procedures, subroutines, segments of program code, drivers, firmware, microcode, circuitry, data, databases, data structures, tables, arrays, and variables. The functionality provided in components and "~ units" may be combined into fewer components and "~ units" or further separated into additional components and "~ units". Further, components and "~ units" may be implemented to operate one or more central processing units (CPUs) in a device or a secure multimedia card. Also, a unit may include one or more processors in an embodiment.

[0043] FIG. **1** is a block diagram illustrating an example multi-access edge computing (MEC) technology in a network environment **100** according to various embodiments.

[0044] Referring to FIG. **1**, the network environment **100** of the disclosure may include a terminal **110**, an access network (AN) **120**, an edge data network **130**, and a service server **140**. Also, although not shown in FIG. **1**, the network environment **100** of the disclosure may include an edge data network configuration server.

[0045] That is, the network environment **100** of the disclosure may include a plurality of elements for supporting a MEC-based service. However, components included in the network environment **100** are not limited to the components illustrated in FIG. **1**.

[0046] According to various embodiments, each of the components included in the network environment **100** may refer to a physical entity unit or may refer to a software or module unit capable of performing an individual function.

[0047] According to various embodiments, the terminal **110** may refer to an apparatus used by a user. For example, the terminal **110** may be a terminal, a user equipment (UE), a mobile station, a subscriber station, a remote terminal, a wireless terminal, or a user device. Referring to FIG. **1**, the terminal **110** may include a first application client (or an application client) **111**, a second application client **113**, and an edge enabler client (or a MEC enabling layer (MEL)) **115**. The terminal **110** may perform a necessary task using the edge enabler client **115** so as to use a MEC service.

[0048] Although not shown in FIG. **1**, according to various embodiments, the terminal **110** may include a multi-access service agent (MSA) and a multi-access service enabler (MSE). According to various embodiments, the MSA may receive information related to authentication of the terminal **110**, authorization and policy (e.g., an app routing policy, a discovery policy, or a monitoring policy). The MSE may set a route according to the policy and manage MEC-based data transmission. According to various embodiments, the edge enabler client **115** may refer to an element that performs a task required to use a MEC service among services of the MSE.

[0049] According to various embodiments of the disclosure, the terminal **110** may execute a plurality of applications. For example, the terminal **110** may execute the first application client **111** and the second application client **113**. The plurality of applications may require different network services based on at least one of a required data transmission speed, a latency (or a speed), reliability, the number of electronic devices accessing a network, a network accessing cycle of the terminal **110**, or average data usage. The different network services may include, for example, enhanced mobile broadband (eMBB), ultra-reliable and low latency communication (URLLC), or massive machine type communication (mMTC).

[0050] An application client of the terminal **110** may refer, for example, to a basic application pre-installed in the terminal **110** or an application provided by a third party. In other words, the application client may refer to a client application program driven in the terminal **110** for a particular application service. Several application clients may be driven in the terminal **110**. At least one of the application clients may use a service provided from the edge data network **130**. For example, the application client may be an application installed in and executed by the terminal **110**, and may provide a function of transmitting or receiving data through the edge data network **130**. The application client of the terminal **110** may refer to application software executed on the terminal **110** to use a function provided by at least one particular edge application.

[0051] According to various embodiments, a plurality of application clients (e.g., the first application client **111** and the second application client **113**) of the terminal **110** may perform data transmission with the service server **140** based on a required network service type, or may perform data transmission based on edge computing with the edge data network **130**. For example, when the first application client **111** does not require a low latency, the first application client **111** may perform data transmission with the service server **140**. As another example, when the second application client **113** requires a low latency, the second application client **113** may perform MEC-based data transmission with the edge data network **130**.

[0052] According to various embodiments, an application of the terminal **110** may be referred to as an application client, a client application (client app), or a UE application (UE app). For convenience of description, hereinafter, an application of the terminal **110** is referred to as an application client.

[0053] According to various embodiments, the AN **120** may provide a channel for wireless communication with the terminal **110**. For example, the AN **120** may refer to a radio access network (RAN), a base station, an eNodeB (eNB), a 5th generation (5G) node, a transmission/reception point (TRP), or a 5th generation nodeB (5GNB).

[0054] According to various embodiments, the edge data network **130** may refer, for example, to a server accessed by the terminal **110** to use the MEC service. The edge data network **130** may be provided at a location geographically close to an electronic device, for example, inside a base station or near the base station. According to various embodiments, the edge data network **130** may transmit or receive data to or from the terminal **110** without passing through an external data network (DN) (e.g., the Internet). According to various embodiments, MEC may be referred to as multi-access edge computing or mobile-edge computing.

[0055] According to various embodiments, the edge data network **130** may be referred to as a MEC host, an edge computing server, a mobile edge host, an edge computing

platform, or a MEC server. For convenience of description, hereinafter, the MEC server is referred to as the edge data network **130**. Referring to FIG. **1**, the edge data network **130** may include a first edge application **131**, a second edge application **133**, and an edge enabler server (or a MEC platform (MEP)) **135**. The edge enabler server **135** may refer to a component for providing the MEC service or performing traffic control in the edge data network **130**.

[0056] According to various embodiments, the edge data network **130** may execute a plurality of applications. For example, the edge data network **130** may execute the first edge application **131** and the second edge application **133**. According to various embodiments, an edge application may refer to an application provided by a third party in an edge data network providing a MEC service and may be referred to as an edge application. The edge application may be used to form a data session with an application client to transmit or receive data related to the application client. In other words, the edge application may provide the data session with the application client. According to various embodiments, data session may refer to a communication path formed so that an application client of the terminal **110** and an edge application of the edge data network **130** can transmit or receive data.

[0057] According to various embodiments, an application of the edge data network **130** may be referred to as a MEC application (MEC app or ME app), an edge application server, or an edge application. For convenience, hereinafter, the application of the edge data network **130** is referred to as an edge application. Here, the edge application may refer to an application server present in an edge data network.

[0058] According to various embodiments, the service server **140** may provide content related to an application. For example, the service server **140** may be managed by a content provider. According to various embodiments of the disclosure, the service server **140** may transmit or receive data to or from the terminal **110** through an external DN (e.g., the Internet). For example, the service server **140** may refer to a server (e.g., a Youtube cloud server, an AfreecaTV server, or a Twitch server) that may provide data related to a streaming service.

[0059] Although not shown in FIG. **1**, the network environment **100** may include an edge data network configuration server. In various embodiments, the edge data network configuration server may provide edge data configuration information to the edge enabler client **115** in the terminal **110**. For example, the edge data network configuration server may provide configuration information for using the MEC service (e.g., information about an edge data network that provides a service to a certain area or information for identifying the edge data network) to the edge data network **130** or the terminal **110**. In various embodiments, the edge data network configuration server may be referred to as an edge data network management server, an edge configuration server, or a configuration server, and may perform a function of a mobile edge platform manager (MEPM) or a multi-access edge orchestrator (MEO).

[0060] Although not shown in FIG. **1**, a core network (CN) and a DN may be present between the AN **120** and the edge data network **130**. According to various embodiments, the DN may provide a service (e.g., an Internet service or an IP multimedia subsystem (IMS) service) by transmitting or receiving data (or a data packet) to or from the terminal **110** through the CN and the AN **120**. For example, the DN may be managed by a communication provider. According to various embodiments, the edge data network **130** may be connected to the AN **120** or the CN through the DN (e.g., a local DN).

[0061] With the development of information and communication technology (ICT) technology and the distribution of high-end smartphones, Internet-centered one-person media have rapidly increased. Accordingly, subscriptions of viewers to streaming services such as sports streaming and product launch streaming through one-person media have also increased. However, in the case of a live broadcast of a sports event such as sports streaming, because a streamer uploads a live video and a viewer downloads a video from a local stream platform server such as a content delivery network or content distribution network (CDN), latency may occur. Also, when the viewer searches for a desired live broadcast channel, a procedure of inputting information about the desired live broadcast channel to a terminal and searching for the desired live broadcast channel is required. In this case, due to the procedure, the viewer may experience inconvenience in searching and switching a broadcast channel. Also, a 5th generation (5G) communication system requires location information of a terminal using the 5G communication system within several meters (e.g., 2 meters). Accordingly, high accuracy of the location information of the terminal may be achieved.

[0062] In order to solve problems with existing streaming services, location information with high accuracy achieved in a 5G communication may be used. That is, the disclosure provides a method, performed by an edge data network, of obtaining location information of a streamer terminal and a packet transmitted to a platform related to a live broadcast, and providing a live broadcast service to a viewer connected to the edge data network. Also, the edge data network may obtain location information of the streamer terminal and a viewer terminal. The edge data network may provide a streaming service to the viewer terminal connected to the edge data network, based on the obtained location information.

[0063] The term "streaming" used herein may refer, for example, to technology in which data is transmitted through the Internet or by the edge data network **130** to the terminal **110** and is played in real time. A streaming service may refer, for example, to a service of playing various content in real time in a terminal using streaming technology. In an embodiment of the disclosure, streaming may include live streaming. Live streaming may refer, for example, to streaming in real time by transmitting a video obtained using a digital video (DV) camera or the like through a computer network, using streaming technology.

[0064] The term "streamer terminal" used herein may refer, for example, to a terminal that performs streaming. For example, a streamer terminal may refer, for example, to a terminal that creates streaming media such as live broadcast. That is, a streamer terminal may refer, for example, to a terminal that broadcasts an image captured by the streamer terminal, an image displayed on the streamer terminal, or an image stored in the streamer terminal through the edge data network **130** or the Internet so that other terminals view the image.

[0065] The term "content" used herein may refer, for example, to a voice or a video itself that may be streamed, or may refer to a channel through which a voice or a video is streamed.

[0066] The term "content list" used herein may refer, for example, to a set of content. Also, content list information may refer, for example, to information related to a content list. For example, content list information may include information about a plurality of content provided from a plurality of streamer terminals.

[0067] The term "caching" used herein may refer, for example, to technology of obtaining data in advance from a data-providing apparatus (e.g., a terminal or a server) and storing the data, before there is a request for the data. Due to caching, data may be provided with a low latency when there is a request for the data.

[0068] FIG. **2** is a signal flow diagram illustrating an example operating procedure of a plurality of apparatuses for providing a MEC-based streaming service according to various embodiments.

[0069] In FIG. **2**, a network environment may include a streamer terminal **210**, the terminal **110**, the edge data network **130**, and the service server **140**. However, the disclosure is not limited thereto, and the network environment of FIG. **2** may further include additional elements. The terminal **110** used herein may refer to a viewer terminal that may view content provided by the streamer terminal **210**. That is, when the streamer terminal **210** performs a live broadcast, the terminal **110** may play the live broadcast in the terminal **110**.

[0070] Referring to FIG. **2**, in operation **201**, the streamer terminal **210** may transmit a domain name system (DNS) request related to a streaming service. For example, the streamer terminal **210** may execute an application for performing streaming. In this case, the application executed by the streamer terminal **210** may be an application through which the edge data network **130** may provide a service. The streamer terminal **210** may transmit the DNS request to the edge data network **130**, in order to drive the application on the edge data network **130**. In various embodiments, the DNS request may refer to a message transmitted by the streamer terminal **210**, in order to obtain an Internet protocol (IP) address of the service server **140** that provides the streaming service.

[0071] Although not shown in FIG. **2**, the edge data network **130** may transmit the DNS request received from the streamer terminal **210** to a DNS server (e.g., a local DNS server). When the DNS server receiving the DNS request knows the IP address of the service server **140**, the DNS server may transmit the stored IP address of the service server **140** to the edge data network **130**. Alternatively, when the DNS server receiving the DNS request does not know the IP address of the service server **140**, the DNS server may ask another DNS server for the IP address and may receive information about the IP address from the other DNS server. The DNS server may transmit the IP address of the service server **140** to the edge data network **130**.

[0072] In operation **203**, the edge data network **130** may store location information of the streamer terminal **210**. That is, the edge data network **130** may receive the DNS request related to the streaming service and may recognize the streaming service. The edge data network **130** may store the location information of the streamer terminal **210**. For example, the edge data network **130** may receive the IP address of the service server **140** from the DNS server as described above in operation **201**. The edge data network **130** may determine that the IP address of the service server **140** is the IP address of the service server **140** that provides the streaming service, based on the received IP address of the service server **140**.

[0073] Accordingly, the edge data network **130** may recognize that the streamer terminal **210** requests the streaming service. The edge data network **130** recognizing that the streaming service is requested may store the location information of the streamer terminal **210**. In this case, the location information of the streamer terminal **210** may be included in the DNS request transmitted from the streamer terminal **210** to the edge data network **130** in operation **201**. Alternatively, the location information of the streamer terminal **210** may be transmitted from the streamer terminal **210** to the edge data network **130**, separately from the DNS request. Alternatively, the edge data network **130** may obtain the location information of the streamer terminal **210** from a 3rd generation partnership project (3GPP) network. In various embodiments, the 3GPP network (i.e., a wireless communication system following 3GPP standards) may provide a wireless communication service to the streamer terminal **210**.

[0074] In various embodiments, the edge data network **130** may request the 3GPP network (or a network exposure function (NEF) of the 3GPP network) for the location information of the streamer terminal **210**, and may obtain the location information of the streamer terminal **210** from the 3GPP network. For example, the edge data network **130** may request the NEF of the 3GPP network to subscribe to event reporting related to a location of the streamer terminal **210** provided by the NEF. The edge data network **130** may receive an event report including the location information of the streamer terminal **210** from the NEF.

[0075] According to various embodiments, regarding a service of subscribing to the event reporting related to the location of the streamer terminal **210**, requested by the edge data network **130** to the NEF of the 3GPP network, a method of subscribing to the event reporting related to the location of the streamer terminal **210** may be set. For example, the number of event reports, a reporting period, whether to report periodically, and a reporting periodicity may be set. Accordingly, the edge data network **130** may obtain the location information of the streamer terminal **210**, by setting the method of subscribing to the event reporting related to the location of the streamer terminal **210**, from the 3GPP network (or the NEF of the 3GPP network).

[0076] In operation **205**, the edge data network **130** may transmit a response to the DNS request. For example, the edge data network **130** may transmit the information about the IP address of the service server **140** received from the DNS server to the streamer terminal **210**. Although operation **205** is performed after operation **203** in FIG. **2**, the disclosure is not limited thereto. That is, operation **205** may be performed before or simultaneously with operation **203**.

[0077] In operation **207**, the streamer terminal **210** may provide a plurality of content related to the streaming service. For example, when the streamer terminal **210** performs streaming of a video, the streamer terminal **210** may transmit a data packet related to the video to the edge data network **130**. Alternatively, when the streamer terminal **210** performs streaming of music, the streamer terminal **210** may transmit a data packet related to the music to the edge data network **130**.

[0078] In operation **209**, the edge data network **130** may provide the plurality of content related to the streaming

service. The edge data network **130** receiving the plurality of content related to the streaming service from the streamer terminal **210** in operation **207** may transmit the received plurality of content to the service server **140**. In various embodiments, the edge data network **130** may transmit information related to the received plurality of content (content-related information) to the service server **140**. For example, the content-related information may include an icon related to the content and the location information of the streamer terminal **210** that transmits the content.

[0079] Although not shown in FIG. **2**, the streamer terminal **210** may be a terminal connected by wire or wirelessly to the edge data network **130**, or may be a terminal not connected by wire or wirelessly to the edge data network **130**. In various embodiments, when the streamer terminal **210** is a terminal connected to the edge data network **130**, as described in operation **209**, the edge data network **130** may receive the plurality of content from the streamer terminal **210** and may transmit the received plurality of content to the service server **140**.

[0080] Alternatively, when the streamer terminal **210** is a terminal not connected to the edge data network **130**, the streamer terminal **210** may directly provide the plurality of content related to the streaming service to the service server **140**. In this case, the service server **140** may transmit the received plurality of content to the edge data network **130**. In contrast, the service server **140** may transmit the information related to the plurality of content (the content-related information) including the icon related to the received plurality of content and the location information of the streamer terminal **210** related to the received plurality of content to the edge data network **130**.

[0081] As described above with reference to FIG. **2**, the edge data network **130** may store the location information of the streamer terminal **210** based on the DNS request from the streamer terminal **210**, and the streamer terminal **210** may provide the plurality of content related to the streaming service to the edge data network **130**. A method, performed by the edge data network **130**, of providing a plurality of content related to a streaming service received from the streamer terminal **210** to the terminal **110** will be described in detail with reference to FIG. **3**.

[0082] FIG. **3** is a signal flow diagram illustrating an example operating procedure between an edge data network and a terminal for providing a MEC-based streaming service according to various embodiments.

[0083] Referring to FIG. **3**, in operation **301**, the edge data network **130** may cache a plurality of content related to a streaming service. That is, the edge data network **130** may cache the plurality of content related to the streaming service received from the streamer terminal **210** in operation **207** of FIG. **2**. For example, before the edge data network **130** receives a request for the content related to the streaming service from the terminal **110**, the edge data network **130** may previously store the plurality of content related to the streaming service. In various embodiments, the edge data network **130** may cache the plurality of content related to the streaming service received from the streamer terminal **210** at specific time intervals (e.g., every 10 minutes), or may cache the plurality of content received within a recent specific time from a current time.

[0084] Operation **301** may be performed after operation **207**, before operation **209**, simultaneously with operation **209**, or after operation **209** of FIG. **2**. As described in operation **301**, because the edge data network **130** previously caches the plurality of content provided from the streamer terminal **210** and provides the content to the terminal **110**, a service latency of the terminal **110** using the streaming service may be reduced.

[0085] In operation **303**, the terminal **110** may transmit a message for requesting content list information corresponding to the terminal **110**. In various embodiments, the content list information corresponding to the terminal **110** may refer to content provided by the streamer terminal **210** included in a visual field that may be photographed by a camera of the terminal **110**. In various embodiments, the message for requesting the content list information may include information about a location of the terminal **110**, a direction of the camera of the terminal **110**, or a field of view (FOV) of the camera of the terminal **110**. In various embodiments, when the message for requesting the content list information does not include the information about the location of the terminal **110**, the edge data network **130** may obtain location information of the terminal **110** from a 3GPP network. The information included in the message for requesting the content list information will be described below in detail with reference to FIGS. **10** and **11**. Although operation **303** is performed after operation **301** in FIG. **3**, the disclosure is not limited thereto. That is, operation **303** may be performed before or simultaneously with operation **301**.

[0086] In operation **305**, the edge data network **130** may determine the content list information corresponding to the terminal **110** from the cached plurality of content. In various embodiments, the edge data network **130** may determine the content list information corresponding to the terminal **110** based on the information included in the message for requesting the content list information received from the terminal **110** and location information of the streamer terminal **210**. In this case, the location information of the streamer terminal **210** may be location information stored in the edge data network **130** in operation **203** of FIG. **2**. A method of determining the content list information will be described in detail with reference to FIG. **5**.

[0087] In various embodiments, the content list information may include content ID information indicating content corresponding to the terminal **110** from among the plurality of content, attribute information (a resolution, a voice, a bit rate, codec information, a content size, a content format, etc.) of the content corresponding to the terminal **110**, streamer terminal ID information related to the content corresponding to the terminal, user ID information of the streamer terminal related to the content corresponding to the terminal **110**, ID information of a server storing the content corresponding to the terminal **110** (e.g., a MEC server A, a service server B, or an edge data network C), IP information of the server storing the content corresponding to the terminal **110**, and information used by the terminal **110** to determine a location for displaying an icon (or information) related to the content on a two-dimensional (2D) plane. Also, the content list information may include information related to a location of the streamer terminal corresponding to the terminal **110**, information related to the location of the streamer terminal within a 2D image captured by the terminal **110**, and information related to an icon or thumbnail of content provided by the streamer terminal corresponding to the terminal **110**.

[0088] However, the information that may be included in the content list information is not limited to the above examples, and various information may be included in the content list information.

[0089] In various embodiments, the following methods may be considered, as to where the terminal **110** displays the icon (or the information) related to the content on the two-dimensional plane. For example, in a first method, when the edge data network **130** transmits the location information of the streamer terminal **210** to the terminal **110**, the terminal **110** may display a content-related icon at a specific location of a map or the 2D image captured by the terminal **110**, based on the location information of the streamer terminal **210**. In the first method, the information used by the terminal **110** to determine the location for displaying the icon (or information related to the content on the 2D plane) may include the location information of the streamer terminal **210**.

[0090] In a second method, the edge data network **130** may determine that the content-related icon needs to be displayed at the specific location of the map or the 2D image captured by the terminal **110**, based on the location information of the terminal **110**. For example, the edge data network **130** may determine to display the content-related icon on a 256th pixel in an X-axis and a 234th pixel in a Y-axis of the 2D image captured by the terminal **110**. The edge data network **130** may transmit information about the specific location of the content-related icon to be displayed on the map or the 2D image captured by the terminal **110** to the terminal **110**. The terminal **110** may display the content-related icon at the specific location, based on the information about the specific location of the content-related icon received from the edge data network **130**. In the second method, the information used by the terminal **110** to determine the location for displaying the icon (or information) related to the content on the 2D plane may include the information about the specific location (e.g., the 256th pixel in the X-axis and the 234th pixel in the Y-axis of the 2D image) of the content-related icon to be displayed on the map or the 2D image captured by the terminal **110**.

[0091] In a third method, the edge data network **130** may determine to display the content-related icon at a feature point of the map or the 2D image captured by the terminal **110**, based on the location information of the terminal **110**. For example, the edge data network **130** may determine a chair located second in a right direction from a front door as the feature point, in the 2D image captured by the terminal **110**. The edge data network **130** may transmit information about the feature point of the content-related icon to be displayed on the map or the 2D image captured by the terminal **110** to the terminal **110**. The terminal **110** may display the content-related icon by tracking the feature point, based on the information about the feature point of the content-related icon received from the edge data network **130**. In the third method, the information used by the terminal **110** to determine the location for displaying the icon (or information) related to the content on the 2D plane may include the information about the feature point (e.g., the chair located second in the right direction from the front door in the 2D image) of the content-related icon to be displayed on the map or the 2D image captured by the terminal **110**.

[0092] However, the information used by the terminal **110** to determine the location for displaying the icon (or information) related to the content on the 2D plane is not limited to the three examples, and various information may be included in the information used by the terminal **110** to determine the location for displaying the icon (or information) related to the content on the 2D plane.

[0093] In operation **307**, the edge data network **130** may transmit the determined content list information. For example, the edge data network **130** may transmit the content list information corresponding to the terminal **110** determined in operation **305** to the terminal **110**. In various embodiments, the content list information corresponding to the terminal **110** may be generated to include an icon related to the content provided by the streamer terminal included in the visual field that may be photographed by the camera of the terminal **110**. The edge data network **130** may transmit the content list information including the icon to the terminal **110**.

[0094] In operation **308**, the terminal **110** may display a user interface (UI) based on the received content list information. For example, the terminal **110** may display the UI indicating the received content list information on a display of the terminal **110**. For example, the terminal **110** may display the icon (or information) related to the content on the 2D plane captured by the terminal **110**, based on the information used by the terminal **110** to determine the location for displaying the icon (or information) related to the content on the 2D plane, included in the content list information. In various embodiments, the terminal may display the icon (or information) related to the content on the 2D plane captured by the terminal **110** based on augmented reality (AR), which will be described in more detail with reference to FIG. **9**.

[0095] In operation **309**, the terminal **110** may transmit a playback request message for content selected based on the content list information. In various embodiments, the terminal **110** may receive the determined content list information from the edge data network **130**. The terminal **110** may select specific content based on the received content list information, according to a user input or a rule that is pre-determined in the terminal **110**. In order to play the selected content, the terminal **110** may transmit a message for requesting data for playing the selected content to the edge data network **130**.

[0096] In various embodiments of the disclosure, the pre-determined rule may include a rule for preferentially selecting content of a streamer terminal preferred by a user or a preferred channel pre-input by the user of the terminal **110**. Also, the pre-determined rule may include a rule for preferentially selecting content with a low latency during streaming in the terminal **110**. Also, the pre-determined rule may include a rule for preferentially selecting content having excellent image quality. Also, the pre-determined rule may include a rule for selecting specific content, in consideration of a previous viewing history of the user. Also, the pre-determined rule may include a rule for preferentially selecting content meeting a requirement of the terminal **110**. For example, the requirement of the terminal **110** may include a format, a codec, a resolution, or a bit rate of content that may be played by the terminal **110**.

[0097] In various embodiments, the playback request message may include information about a network state of the terminal or the requirement of the terminal **110**. In various embodiments, the information about the network state of the terminal **110** or the requirement of the terminal **110** may be

transmitted by the message for requesting the content list information corresponding to the terminal **110** in operation **303**.

[0098] In operation **311**, the edge data network **130** may perform transcoding on the selected content. That is, the edge data network **130** may perform encoding on data about the selected content, based on the network state of the terminal **110** or the requirement of the terminal **110**. An example transcoding method according to the disclosure will be described below in detail with reference to FIG. **6**.

[0099] In operation **313**, the edge data network **130** may transmit the data about the selected content. That is, the edge data network **130** may transmit data for playing the selected content on which transcoding is performed to the terminal **110**. Although not shown in FIG. **3**, the terminal **110** may receive the data about the selected content and may play the content based on the received data.

[0100] As described with reference to FIG. **3**, because the terminal **110** and the edge data network **130** exchange a message with each other, the edge data network **130** may provide the streaming service to the terminal **110**. FIG. **4** illustrates an overall example operating procedure performed by the edge data network **130**. For convenience of description, the same description as that made with reference to FIG. **3** will not be repeated.

[0101] Referring to FIG. **4**, in operation **401**, the edge data network **130** may cache a plurality of content related to a streaming service. For example, the edge data network **130** may receive a plurality of content related to streaming from at least one streamer terminal that performs the streaming, and may previously store the plurality of content.

[0102] In operation **403**, the edge data network **130** may receive a message for requesting content list information corresponding to the terminal **110**. That is, in order to play content streamed by the at least one streamer terminal in the terminal **110**, the terminal **110** may transmit a request message for requesting the content list information to the edge data network **130**.

[0103] In operation **405**, the edge data network **130** may determine the content list information corresponding to the terminal **110** from the cached plurality of content. For example, the edge data network **130** may determine the content list information corresponding to the terminal **110**, based on information included in the request message received from the terminal **110**. In other embodiments, the edge data network **130** may determine the content list information corresponding to the terminal **110**, based on information related to a plurality of content that is not cached in the edge data network **130**, but is received from the service server **140**.

[0104] In operation **407**, the edge data network **130** may transmit the content list information to the terminal **110**. In various embodiments, the edge data network **130** may generate the content list information by displaying an icon related to content provided by the at least one streamer terminal at a location of the at least one streamer terminal, and may transmit the generated content list information to the terminal **110**.

[0105] In operation **409**, the edge data network **130** may receive a playback request message for at least one content selected based on the content list information. In various embodiments, the terminal **110** may select the at least one content based on the content list information received from the edge data network **130**, and may transmit the playback request message to the edge data network **130** to play the selected at least one content.

[0106] In operation **411**, the edge data network **130** may provide data about the at least one content to the terminal **110**. Although not shown in FIG. **4**, the edge data network **130** may perform transcoding on the selected at least one content, and may provide transcoded data to the terminal **110**.

[0107] As described by way of example with reference to FIG. **4**, the edge data network **130** may perform an operation for providing the streaming service to the terminal **110**. An example method of determining content list information provided to the terminal **110** will be described in detail with reference to FIG. **5**.

[0108] FIG. **5** is a flowchart illustrating an example operating method of an edge data network for determining content list information according to various embodiments.

[0109] Referring to FIG. **5**, in operation **501**, the edge data network **130** may determine whether the streamer terminal **210** is included in a visual field of a camera of the terminal **110**. For example, the edge data network **130** may determine whether the streamer terminal **210** is included in the visual field that may be photographed by the camera of the terminal **110**, based on a location of the terminal **110**, a direction of the camera of the terminal **110**, an FOV of the camera of the terminal **110**, and location information of the streamer terminal **210**. In various embodiments, the edge data network **130** may obtain the location information of the streamer terminal **210** from the streamer terminal **210** or a 3GPP network.

[0110] In operation **503**, the edge data network **130** may generate content list information based on a determination result. In various embodiments, when the streamer terminal **210** is included in the visual field that may be photographed by the camera of the terminal **110**, the edge data network **130** may add content provided by the streamer terminal **210** to the content list information corresponding to the terminal **110**. The edge data network **130** may determine a location of the streamer terminal **210** on a 2D plane onto which the visual field that may be photographed by the camera of the terminal **110** is projected. The edge data network **130** may generate the content list information, by displaying an icon related to the content provided by the streamer terminal **210** at the location of the streamer terminal **210** on the determined 2D plane. That is, the content list information of the disclosure may refer, for example, to information indicating that the icon related to the content provided by the streamer terminal **210** is displayed on the 2D plane. In various embodiments, the icon related to the content provided by the streamer terminal **210** may include a clip image of the content provided by the streamer terminal **210** or a thumbnail related to the content.

[0111] In various embodiments, when the streamer terminal **210** is not included in the visual field that may be photographed by the camera of the terminal **110**, there may be no content list information corresponding to the terminal **110**. Hence, the edge data network **130** may not provide the content list information corresponding to the terminal **110** to the terminal **110**. In various embodiments, when the streamer terminal **210** is not included in the visual field that may be photographed by the camera of the terminal **110**, the edge data network **130** may transmit a message for changing a location or an angle of the camera to the terminal **110**, so

that another streamer terminal is included in the visual field of the camera of the terminal **110**.

[0112] In another embodiments, when the streamer terminal **210** is not included in the visual field that may be photographed by the camera of the terminal **110**, the edge data network **130** may request the service server **140** for content-related information including an icon related to a plurality of content and the location information of the streamer terminal **210** related to the plurality of content. The service server **140** may transmit the content or the content-related information received from the streamer terminal **210** to the edge data network **130**. Accordingly, the edge data network **130** may generate the content list information, in consideration of the content cached in the service server **140** as well as the content cached in the edge data network **130** itself. As described with reference to FIG. **5**, the edge data network **130** may determine the content list information corresponding to the terminal **110**, based on information included in a message for requesting the content list information corresponding to the terminal **110** and the location information of the streamer terminal **210**. An example method, performed by the edge data network **130**, of performing transcoding based on a playback request message received from the terminal **110** will be described in detail with reference to FIG. **6**.

[0113] FIG. **6** is a flowchart illustrating an example operating method of an edge data network for performing transcoding on content according to various embodiments.

[0114] Although not shown in FIG. **6**, in various embodiments, the terminal **110** may select at least one content based on content list information received from the edge data network **130**, according to a user input or a rule that is pre-determined in the terminal **110**. In various embodiments, the pre-determined rule may refer to a rule that is pre-stored in the terminal **110** in order for a user to select content by a user, or a rule that is set by the terminal **110** itself.

[0115] Referring to FIG. **6**, in operation **601**, the edge data network **130** may perform transcoding on at least one content based on information included in a playback request message. According various embodiments, the playback request message may include information about a network state of the terminal **110** or a requirement of the terminal **110**. In various embodiments, the requirement of the terminal **110** may include information such as a format, a codec, a resolution, or a bit rate of content that may be played by the terminal **110**. Also, the network state of the terminal **110** may include a speed of a network used by the terminal **110**.

[0116] In various embodiments, transcoding may refer, for example, to a process in which a content providing apparatus for providing content optimizes the content, based on conditions for a playback apparatus for playing the content or various other conditions. For example, the conditions for the playback apparatus may refer to a resolution, a bit rate, or a codec of content that may be played by the playback apparatus.

[0117] In various embodiments, the process of optimizing the content may refer to a process of encoding data about the content based on a specific condition. For example, the edge data network **130** of the disclosure may encode data about the selected at least one content, based on the requirement of the terminal **110** or the network state of the terminal **110** that is to play the selected at least one content. Through the encoding, the edge data network **130** may generate the data about the at least one content meeting the requirement of the terminal **110**. In various embodiments, the data about the content may refer to a data packet or a data stream required to play the content.

[0118] In operation **603**, the edge data network **130** may transmit the data about the at least one content on which the transcoding is performed to the terminal **110**. For example, the edge data network **130** may transmit the data about the at least one content on which transcoding is performed in operation **601** to the terminal **110** that is to play the content. The terminal **110** may play the content, based on the data about the at least one content on which transcoding is performed.

[0119] In various embodiments of the disclosure, the edge data network **130** may transcode the content using an artificial intelligence (AI) codec. According to various embodiments, a method of transcoding content using an AI codec may include AI encoding. For example, the AI encoding may include AI downscaling and first encoding. For example, the edge data network **130** may generate a first image, by performing AI downscaling on an original image having a high resolution. The edge data network **130** may perform first encoding on the first image having a relatively low resolution compared with that of the original image. In this case, a bit rate may be reduced, when compared to a case where the first encoding is performed on the original image having a high resolution. In various embodiments, AI-encoded data may be generated through the AI encoding, that is, the AI downscaling and the first encoding. In various embodiments, the AI-encoded data may include image data and AI data. In various embodiments, the AI-encoded data may refer, for example, to content transcoded by the edge data network **130**.

[0120] In various embodiments, the edge data network **130** may transmit the AI-encoded data to the terminal **110**. The terminal **110** may perform AI decoding based on the AI-encoded data. For example, the terminal **110** may generate a second image by performing first decoding, based on the received AI-encoded data. The terminal **110** may generate a third image by performing AI upscaling on the second image. The terminal **110** may display the generated third image on a display.

[0121] As described with reference to FIG. **6**, the edge data network **130** may perform a transcoding operation to provide content related to streaming to the terminal **110**. In the method of FIG. **6**, because the edge data network **130** performs transcoding only when requested by the terminal **110** connected to the edge data network **130**, efficient transcoding may be performed. Accordingly, resources used for transcoding of the edge data network **130** may be saved. In various embodiments, the edge data network **130** may identify the terminal **110** connected to the edge data network **130** based on an IP band or the like.

[0122] According to various embodiments, the edge data network **130** may select a bit rate and a resolution range of content in consideration of a network speed or the like of the terminal **110**. Also, the edge data network **130** other than the service server **140** may perform transcoding on content (e.g., an image). Accordingly, because the edge data network **130** does not need to separately receive data about the content from the service server **140**, a latency required to provide the data about the content to the terminal **110** may be reduced. FIG. **7** illustrates an overall example operating procedure

performed by the terminal **110**. For convenience of description, the same description as that made with reference to FIG. **3** will not be repeated.

[0123] FIG. **7** is a flowchart illustrating an example operating method of a terminal according to various embodiments.

[0124] Referring to FIG. **7**, in operation **701**, the terminal **110** may transmit a message for requesting content list information corresponding to the terminal **110** to an edge data network. In various embodiments, the terminal **110** may transmit the message for requesting the content list information corresponding to the terminal **110** to the edge data network **130**, in order to see content related to a streaming service.

[0125] In operation **703**, the terminal **110** may receive the content list information corresponding to the terminal **110** from the edge data network. According to various embodiments, the terminal **110** may receive the content list information corresponding to the terminal **110** determined by the edge data network **130**, from the edge data network **130**.

[0126] In operation **704**, the terminal **110** may display a UI based on the content list information. For example, the terminal **110** may display an icon (or information) related to the content on a 2D plane captured by the terminal **110**. For example, the terminal **110** may display the icon (or information) related to the content on the 2D plane, based on information used by the terminal **110** to determine a location for displaying the icon (or information) related to the content on the 2D plane, included in the content list information, which will be described in more detail with reference to FIG. **9**.

[0127] In operation **705**, the terminal **110** may transmit a playback request message for at least one content selected based on the content list information to the edge data network **130**. In various embodiments, the terminal **110** may select specific content based on the received content list information according to a user input or a rule that is pre-determined in the terminal **110**, and may transmit the playback request message for the selected at least one content to the edge data network **130**.

[0128] In operation **707**, the terminal **110** may receive data about the at least one content from the edge data network **130**. In various embodiments, the data about the at least one content received from the edge data network **130** may refer to data about at least one content on which transcoding is performed by the edge data network **130**. Although not shown in FIG. **7**, the terminal **110** may play the content based on the received data about the at least one content.

[0129] As described with reference to FIG. **7**, the terminal **110** may transmit a message for requesting content to the edge data network **130**, and may play the content based on data received from the edge data network **130**. FIG. **8** illustrates various example scenarios of providing a streaming service.

[0130] FIG. **8** is a diagram illustrating example scenarios of providing a streaming service according to various embodiments.

[0131] Referring to FIG. **8**, a first terminal **812** may correspond to the streamer terminal **210** of FIG. **2**. Also, a second terminal **832**, a third terminal **834**, and a fourth terminal **842** may correspond to the terminal **110** of FIG. **1**. Also, a first base station **814**, a second base station **816**, a third base station **818**, and a fourth base station **836** may be included in the AN **120** of FIG. **1**. Also, a first edge data network **852**, a second edge data network **854**, and a third edge data network **856** may correspond to the edge data network **130** of FIG. **1**. Also, a cloud server **860**, a local streaming platform **870**, and a global streaming platform **880** may correspond to the service server **140** of FIG. **1**.

[0132] According to an embodiment of the disclosure, the local streaming platform **870** may refer, for example, to a server that may provide content related to a streaming service in a local area (e.g., South Korea). For example, the local streaming platform **870** may refer to a CDN that may provide content related to a streaming service located in a local area (e.g., South Korea).

[0133] According to various embodiments, the global streaming platform **880** may refer, for example, to a server (e.g., Google data center in the United States) that may provide content related to a streaming service in a global area (e.g., the world). For example, the global streaming platform **880** may receive a content provision request from the local streaming platform **870**, and may transmit requested content through the Internet or an edge data network to the local streaming platform **870**.

[0134] According to various embodiments, the cloud server **860** may refer, for example, to a server that stores the content provided by the local streaming platform **870** or transmits the content provided by the local streaming platform **870** to the terminal.

[0135] According to various embodiments, in a first scenario **810**, the first terminal **812** may be connected to at least one edge data network (e.g., the first edge data network **852**, the second edge data network **854**, or the third edge data network **856**) through the first base station **814**, the second base station **816**, and the third base station **818**. The first terminal **812** may perform streaming. For example, the first terminal **812** may perform streaming, by executing an application related to a live broadcast. The first terminal **812** may transmit the content related to the streaming service to at least one edge data network.

[0136] According to various embodiments, in a second scenario **830**, the at least one edge data network may provide the content related to the streaming service to the second terminal **832** and the third terminal **834** through the fourth base station **836**. That is, the second terminal **832** and the third terminal **834** may download the content related to the streaming service provided by the first terminal **812** connected to the same edge data network, from the edge data network.

[0137] According to various embodiments, in a third scenario **840**, the fourth terminal **842** may download the content related to the streaming service from the local streaming platform **870**, through the cloud server **860**. Unlike in the third scenario **840**, in the first scenario **810** and the second scenario **830**, a terminal (e.g., the first terminal **812**) that performs streaming and a terminal (e.g., the second terminal **832** and the third terminal **834**) that plays streaming content are connected through an edge data network. Accordingly, a latency required to provide the streaming content to the terminal (e.g., the second terminal **832** and the third terminal **834**) that plays the streaming content may be reduced.

[0138] FIG. **9** is a diagram illustrating an example of providing a streaming service according to various embodiments. For example, in FIG. **9**, the terminal **110** displays a UI, based on content list information received from the edge data network **130**.

[0139] Referring to FIG. **9**, an AR-based channel service **910** or a map-based channel service **920** is described. In various embodiments, the AR-based channel service **910** may refer, for example, to a service of providing information about a channel related to a streaming service to the terminal **110**, by displaying the channel related to the streaming service using AR on a display of the terminal **110**. In various embodiments, the channel related to the streaming service may be included in content related to the streaming service.

[0140] For example, a user of the terminal **110** may go to a stadium where a sports event (e.g., a baseball game) is held. The user may photograph a part of the stadium using a camera of the terminal **110**. In this case, an icon related to a streamer terminal included in a visual field of the camera of the terminal **110** may be displayed on the display of the terminal **110**. For example, a first icon **912** related to a channel provided through a first streaming application by a first streamer terminal and a second icon **914** related to a channel provided through a second streaming application by a second streamer terminal may be displayed on the display of the terminal **110**. When the user of the terminal **110** selects the second icon **914**, the channel provided through the second streaming application by the second streamer terminal may be provided to the terminal **110**. For example, a video streamed by the second streaming application may be played by the terminal **110**.

[0141] According to various embodiments, the map based channel service **920** may refer to a service of providing information about a channel related to a streaming service to the terminal **110**, by displaying the channel related to the streaming service on a map displayed by an application related to the map. For example, when the application related to the map is executed in the terminal **110**, the terminal **110** may display the map on the display. An icon related to a streamer terminal may be displayed on the map, based on a location of the streamer terminal. For example, a third icon **922** related to a channel provided through a first streaming application by a third streamer terminal and a fourth icon **924** related to a channel provided through a second streaming application by a fourth streamer terminal may be displayed on the map. In various embodiments, when the user of the terminal **110** selects the third icon **922** or the fourth icon **924**, the channel related to the selected icon may be provided to the terminal **110**.

[0142] As described with reference to FIG. **9**, because even when the user of the terminal **110** does not search for a streaming service, a channel related to streaming may be provided to the terminal **110** based on AR or may be provided on a map, the user of the terminal **110** may conveniently search for the channel related to streaming.

[0143] FIG. **10** is a diagram illustrating an example method used to generate content list information according to various embodiments.

[0144] Referring to FIG. **10**, in an embodiment of the disclosure, a visual field may refer to a range (e.g., an angular range, a linear range, or an areal range) that may be observed by a certain object or creature. For example, an eye **1002** may not see all objects around the eye **1002**, but may see only objects included in a visual field **1004** of the eye **1002**.

[0145] In an embodiment of the disclosure, like the eye **1002**, a camera may have a visual field. For example, when the camera photographs an object, a view frustum **1012** having a pyramid shape may be formed around a center of projection **1010**. The view frustum **1012** may be formed based on an FOV of the camera, and may refer to an angle where the camera may capture an image through a lens. Planes that cut the view frustum **1012** in a direction perpendicular to a viewing direction of the lens may be defined as a near plane and a far plane, and referring to FIG. **10**, a near plane may be generated when the view frustum **1012** is cut in the direction perpendicular to the viewing direction at a zNear location, and a far plane may be generated when the view frustum **1012** is cut in the direction perpendicular to the viewing direction at a zFar location. When the camera photographs an object through the lens, the object may be two-dimensionally projected onto the near plane or the far plane.

[0146] Content list information using AR may be provided to the terminal **110**, based on the principle described with reference to FIG. **10**. For example, as described with reference to FIG. **3**, the edge data network **130** may receive a message for requesting the content list information corresponding to the terminal **110** from the terminal **110**, and may determine the content list information corresponding to the terminal **110** from a plurality of content. In order to determine the content list information corresponding to the terminal **110**, the edge data network **130** may determine whether a streamer terminal is included in a visual field of the camera of the terminal **110** and may generate the content list information according to a determination result as described with reference to FIG. **5**. An example method of generating content list information corresponding to the terminal **110** will be described in detail with reference to FIG. **11**.

[0147] FIG. **11** is a diagram illustrating an example method of generating content list information using AR according to various embodiments.

[0148] Referring to FIG. **11**, a view frustum **1112** of the terminal **110** may be formed based on an FOV **1110** of a camera, in a viewing direction of a camera lens of the terminal **110**. In this case, a 2D plane **1120** may be formed within a visible distance where the camera of the terminal **110** may capture an image, in the view frustum **1112** of the terminal **110**. In various embodiments, an object photographed by the camera of the terminal **110** may be projected onto the 2D plane **1120**.

[0149] According to various embodiments, the edge data network **130** may receive a DNS request related to a streaming service from streamer terminals, and may store location information of the streamer terminals. The edge data network **130** may identify a streamer terminal included in the view frustum **1112** of the terminal **110**, based on the stored location information of the streamer terminals. For example, the edge data network **130** may determine that a first streamer terminal **1102** is included in the view frustum **1112** of the terminal **110**, based on the stored location information of the streamer terminals. Also, the edge data network **130** may determine that a second streamer terminal **1104**, a third streamer terminal **1106**, and a fourth streamer terminal **1108** are not included in the view frustum **1112** of the terminal **110**, based on the stored location information of the streamer terminals.

[0150] According to various embodiments, the edge data network **130** may determine that the first streamer terminal **1102** is included in the view frustum **1112** of the terminal **110**, and then may project the first streamer terminal **1102** onto the 2D plane **1120** of the view frustum **1112**. The edge

data network **130** may calculate 2D coordinates of a location at which the first streamer terminal **1102** is projected. The edge data network **130** may display a third streaming application-related icon **1130** streamed by the first streamer terminal **1102**, on the calculated 2D coordinates. In various embodiments, the third streaming application-related icon **1130** may include a clip image or a thumbnail of an image streamed through the third streaming application.

[0151] In various embodiments, the edge data network **130** may provide content list information corresponding to the terminal **110**, to an image captured by the camera of the terminal **110**. The terminal **110** may output an AR image by displaying an icon indicating the content list information corresponding to the terminal **110** to overlap the image captured by the camera of the terminal **110**.

[0152] As described with reference to FIG. **11**, the edge data network **130** may generate content list information corresponding to the terminal **110**, by displaying an icon related to content provided by a streamer terminal on the 2D plane **1120** of the view frustum **1112** of the terminal **110**. The edge data network **130** may provide the generated content list information to the terminal **110**. FIG. **12** illustrates an example method of providing content related to a streaming service, in a scenario in which the edge data network **130** generally exists.

[0153] FIG. **12** is a signal flow diagram illustrating an example procedure of providing content related to a streaming service according to various embodiments.

[0154] In FIG. **12**, a network environment may include the terminal **110**, the edge data network **130**, and the service server **140**. However, the disclosure is not limited thereto, and the network environment of FIG. **12** may further include additional elements.

[0155] Referring to FIG. **12**, in operation **1201**, the terminal **110** may request a streaming list. For example, the terminal **110** may request the edge data network **130** for a list of streaming content, in order to play the streaming content that is broadcast in real time.

[0156] In operation **1203**, the edge data network **130** may request the streaming list. That is, the terminal **110** may request the edge data network **130** for the streaming list, and then the edge data network **130** may request the service server **140** for the streaming list.

[0157] In operation **1205**, the service server **140** may transmit a streaming list response. For example, the service server **140** may provide the list of the streaming content to the terminal **110**, in response to a streaming list request from the edge data network **130**. In various embodiments, the streaming list may include an identifier for identifying the streaming content, and a uniform resource locator (URL) corresponding to the streaming content. Although the streaming list response is directly transmitted to the terminal **110** from the service server **140** in operation **1205** of FIG. **12**, the disclosure is not limited thereto. For example, the edge data network **130** may receive the streaming list response from the service server **140**, and may transmit the streaming list response to the terminal **110**.

[0158] In operation **1207**, the terminal **110** may transmit a streaming content playback request. In various embodiments, the terminal **110** may request the service server **140** to play the streaming content selected in the streaming list, based on the streaming list provided by the service server **140**. Although the streaming content playback request is directly transmitted from the terminal **110** to the service server **140** in FIG. **12**, the disclosure is not limited thereto. For example, the edge data network **130** may receive the streaming content playback request from the terminal **110** and may transmit the streaming content playback request to the service server **140**.

[0159] In operation **1209**, the service server **140** may transmit streaming content-related data. In various embodiments, the service server **140** may transmit data related to the streaming content requested by the terminal **110** to the terminal **110**, based on the streaming content playback request from the terminal **110**. Although not shown in FIG. **12**, the terminal **110** may receive the data related to the streaming content from the service server **140**, and may play the streaming content based on the received data.

[0160] As described with reference to FIG. **12**, in general, the edge data network **130** may request the service server **140** for a streaming list, and the service server **140** may transmit the streaming list and streaming content-related data to the terminal **110**. In contrast, in various embodiments of the disclosure, the edge data network **130** may cache a plurality of content related to a streaming service, and may provide the cached plurality of content to the terminal **110**. Accordingly, in an embodiment of the disclosure, when compared to a method of FIG. **12**, a latency due to a transmission/reception procedure with the service server **140** may be reduced. Also, because a streaming list based on AR may be provided to the terminal **110** according to various embodiments, convenience in live broadcast channel searching and switching of a user of the terminal **110** may be improved.

[0161] FIG. **13** is a signal flow diagram illustrating an example procedure of providing content related to a streaming service according to various embodiments.

[0162] Referring to FIG. **13**, in operation **1301**, the terminal **110** may request the edge data network **130** for streaming list information. For example, the terminal **110** may request the edge data network **130** for list information about streaming content, in order to play the streaming content that is broadcast in real time.

[0163] In operation **1303**, the edge data network **130** may request the service server **140** for content-related information. In various embodiments, the content-related information may include an icon related to content and location information of a streamer terminal that transmits the content.

[0164] In operation **1305**, the service server **140** may transmit a content-related information response to the edge data network **130**. In various embodiments, when the streamer terminal is not connected to the edge data network **130**, the streamer terminal may transmit the content-related information to the service server **140**, and as in operations **1303** and **1305**, the edge data network **130** may request the service server **140** for the content-related information and may receive a request response. Alternatively, in various embodiments, when the edge data network **130** previously stores the content-related information, operations **1303** and **1305** may be omitted.

[0165] In operation **1307**, the edge data network **130** may generate content list information. For example, the edge data network **130** may generate the content list information corresponding to the terminal **110**, based on content cached in the edge data network **130** itself and the content-related information received from the service server **140**.

[0166] In operation **1309**, the edge data network **130** may transmit a streaming list information response to the termi-

nal **110**. For example, the edge data network **130** may transmit the streaming list information response including the generated content list information to the terminal **110**.

[0167] In operation **1311**, the terminal **110** may request the edge data network **130** to play first streaming content. For example, the terminal **110** may select the first streaming content, based on the streaming list information received from the edge data network **130**. The terminal **110** may request the edge data network **130** to play the selected first streaming content.

[0168] In operation **1313**, the edge data network **130** may transmit data related to the first streaming content to the terminal **110**. In various embodiments, the edge data network **130** may previously cache the data related to the first streaming content before a request of the data related to the first streaming content of the terminal **110**. The edge data network **130** may transmit the data related to the first streaming content to the terminal **110** in response to the request of the terminal **110**. That is, the edge data network **130** may not request the service server **140** for the data related to the first streaming content, and may provide the data related to the first streaming content that is cached in the edge data network **130** itself to the terminal **110**.

[0169] In operation **1315**, the terminal **110** may request the edge data network **130** to play second streaming content. For example, the terminal **110** may select the second streaming content, based on the streaming list information received from the edge data network **130**. The terminal **110** may request the edge data network **130** to play the selected second streaming content.

[0170] In operation **1317**, the edge data network **130** may request the service server **140** for data related to the second streaming content. In various embodiments, when the edge data network **130** does not store the data related to the second streaming content, that is, does not previously cache the data related to the second streaming content, the edge data network **130** may request the service server **140** for the data related to the second streaming content.

[0171] In operation **1319**, the service server **140** may transmit a second streaming content-related data response to the edge data network **130**. That is, the service server **140** may transmit the second streaming content-related data response to the edge data network **130**, in response to a request from the edge data network **130**.

[0172] In operation **1321**, the edge data network **130** may perform caching and/or transcoding. In various embodiments, the edge data network **130** may receive the data related to the second streaming content from the service server **140**. The edge data network **130** may cache the received data related to the second streaming content. The edge data network **130** may transcode the data related to the second streaming content. In various embodiments, the edge data network **130** may not cache the data related to the second streaming content, but may transcode the data related to the second streaming content and may provide the transcoded data related to the second streaming content to the terminal **110**. Alternatively, in various embodiments, the edge data network **130** may cache the data related to the second streaming content, may transcode the cached data related to the second streaming content, and may provide the transcoded data related to the second streaming content to the terminal **110**. Alternatively, in various embodiments, the edge data network **130** may transcode the data related to the second streaming content, and then may cache the data related to the second streaming content.

[0173] In operation **1323**, the edge data network **130** may transmit the transcoded data related to the second streaming content to the terminal **110**. For example, the edge data network **130** may perform transcoding on the data related to the second streaming content in operation **1321**, and may transmit the transcoded data related to the second streaming content to the terminal **110**. Although not shown in FIG. **13**, the terminal **110** may play the second streaming content, based on the data related to the second streaming content received from the edge data network **130**.

[0174] FIGS. **14** and **15** illustrate example configurations of the edge data network **130** and the terminal **110** according to various embodiments.

[0175] FIG. **14** is a block diagram illustrating an example configuration of an edge data network according to various embodiments.

[0176] As shown in FIG. **14**, the edge data network **130** of the disclosure may include a processor (e.g., including processing circuitry) **1430**, a communicator (e.g., including communication circuitry) **1410**, and a memory **1420**. However, elements of the edge data network **130** are not limited to those illustrated in FIG. **14**. For example, the edge data network **130** may include more elements or fewer elements than those illustrated in FIG. **14**. Also, the processor **1430**, the communicator **1410**, and the memory **1420** may be implemented as one chip.

[0177] According to various embodiments, the processor **1430** may include various processing circuitry and control a series of processes so that the edge data network **130** operates according to embodiments of the disclosure discussed above. For example, the processor **1430** may control elements of the edge data network **130** to perform a method of providing a streaming service according to various embodiments. A plurality of processors **1430** may be provided, and the processor **1430** may perform an operation of providing a streaming service by executing a program (or a plurality of instructions) stored in the memory **1420**.

[0178] The communicator **1410** may include various communication circuitry and transmit or receive a signal to or from an external device (e.g., the terminal **110**, the AN **120**, the service server **140**, or a 3GPP network). The signal transmitted/received to/from the external device may include control information and data. The communicator **1410** may include a radio frequency (RF) transmitter that up-converts and amplifies a frequency of a transmitted signal, and an RF receiver that performs low-noise amplification on a received signal and down-converts a frequency. However, this is merely an example of the communicator **1410**, and elements of the communicator **1410** are not limited to the RF transmitter and the RF receiver. Also, the communicator **1410** may receive a signal through a wireless channel, may output the signal to the processor **1430**, and may transmit a signal output from the processor **1430** through the wireless channel.

[0179] According to various embodiments, the memory **1420** may store a program and data necessary to operate the edge data network **130**. Also, the memory **1420** may store control information or data included in a signal transmitted/received by the edge data network **130**. The memory **1420** may include a storage medium such as a read-only memory (ROM), a random-access memory (RAM), a hard disk, a compact disc-ROM (CD-ROM), or a digital versatile disk

(DVD), or a combination of storage media. Also, a plurality of memories **1420** may be provided. According to various embodiments, the memory **1420** may store a program (or a plurality of instructions) for performing an operation of providing a streaming service according to various embodiments of the disclosure.

[0180] FIG. **15** is a block diagram illustrating an example configuration of a terminal according to various embodiments.

[0181] As shown in FIG. **15**, the terminal **110** of the disclosure may include a processor (e.g., including processing circuitry) **1530**, a communicator (e.g., including communication circuitry) **1510**, and a memory **1520**. However, elements of the terminal **110** are not limited to those illustrated in FIG. **15**. For example, the terminal **110** may include more elements or fewer elements than those illustrated in FIG. **15**. Also, the processor **1530**, the communicator **1510**, and the memory **1520** may be implemented as one chip.

[0182] According to various embodiments, the processor **1530** may include various processing circuitry and control a series of processes so that the terminal **110** operates according to embodiments of the disclosure discussed above. For example, the processor **1530** may control elements of the terminal **110** to perform a method of receiving a streaming service according to various embodiments of the disclosure. A plurality of processors **1530** may be provided, and the processor **1530** may perform an operation of receiving a streaming service by executing a program stored in the memory **1520**.

[0183] The communicator **1510** may include various communication circuitry and transmit or receive a signal to or from an external device (e.g., the AN **120**, the edge data network **130**, the service server **140**, or a 3GPP network). The signal transmitted/received to/from the external device may include control information and data. The communicator **1510** may include an RF transmitter that up-converts and amplifies a frequency of a transmitted signal, and an RF receiver that performs low-noise amplification on a received signal and down-converts a frequency. However, this is merely an example of the communicator **1510**, and elements of the communicator **1510** are not limited to the RF transmitter and the RF receiver. Also, the communicator **1510** may receive a signal through a wireless channel, may output the signal to the processor **1530**, and may transmit a signal output from the processor **1530** through the wireless channel.

[0184] According to various embodiments, the memory **1520** may store a program (or a plurality of instructions) and data necessary to operate the terminal **110**. Also, the memory **1520** may store control information or data included in a signal transmitted/received by the terminal **110**. The memory **1520** may include a storage medium such as a ROM, a RAM, a hard disk, a CD-ROM, or a DVD, or a combination storage media. Also, a plurality of memories **1520** may be provided. According to various embodiments, the memory **1520** may store a program (or a plurality of instructions) for performing an operation of receiving a streaming service according to embodiments of the disclosure discussed above.

[0185] According to various embodiments, a method, performed by an edge data network, of providing a streaming service to a terminal may include caching a plurality of content related to the streaming service; receiving a message for requesting content list information corresponding to the terminal, from the terminal; determining the content list information corresponding to the terminal, from the cached plurality of content, based on the message for requesting the content list information; transmitting the determined content list information to the terminal; receiving a playback request message for at least one content selected based on the content list information from the terminal; and providing data about the at least one content to the terminal, based on the playback request message.

[0186] The method according to various embodiments may further include storing location information of a streamer terminal that provides the plurality of content related to the streaming service, in response to a domain name system (DNS) request of the streamer terminal.

[0187] According to various embodiments, the message for requesting the content list information may include information about at least one of a location of the terminal, a direction of a camera of the terminal, or a field of view (FOV) of the camera of the terminal.

[0188] According to various embodiments, the determining of the content list information corresponding to the terminal from the cached plurality of content may include determining the content list information corresponding to the terminal, based on information included in the message for requesting the content list information and the location information of the streamer terminal.

[0189] According to various embodiments, the determining of the content list information corresponding to the terminal may include determining whether the streamer terminal is included in a visual field of the camera of the terminal, based on the location of the terminal, the direction of the camera of the terminal, the FOV of the camera of the terminal, and the location information of the streamer terminal; and generating the content list information by displaying an icon related to the plurality of content provided by the streamer terminal, at a location of the streamer terminal on a 2D plane onto which the visual field of the camera of the terminal is projected, based on a determination result.

[0190] According to various embodiments, the playback request message may include information about a network state of the terminal or a requirement of the terminal, and the requirement of the terminal may include information about at least one of a format, a codec, or a resolution of content played (or playable) by the terminal.

[0191] According to various embodiments, the providing of the data about the at least one content to the terminal may include performing transcoding on the at least one content, based on information included in the playback request message; and transmitting the data about the at least one content on which the transcoding is performed to the terminal.

[0192] According to various embodiments, an operating method of a terminal for receiving a streaming service from an edge data network may include transmitting a message for requesting content list information corresponding to the terminal to the edge data network; receiving the content list information corresponding to the terminal determined from a plurality of cached content related to the streaming service, from the edge data network; transmitting a playback request message for at least one content selected based on the content list information to the edge data network; and receiving data about the at least one content, from the edge data network.

[0193] According to various embodiments, the message for requesting the content list information may include information about at least one of a location of the terminal, a direction of a camera of the terminal, or a field of view (FOV) of the camera of the terminal.

[0194] According to various embodiments, the playback request message may include information about a network state of the terminal or a requirement of content played (or playable) by the terminal, wherein the requirement includes information about at least one of a format, a codec, or a resolution of the content played (or playable) by the terminal.

[0195] According to various embodiments, an edge data network for providing a streaming service to a terminal may include a communicator (e.g., including communication circuitry); a memory configured to store a plurality of instructions; and a processor configured to execute the plurality of instructions to cache a plurality of content related to the streaming service, receive a message for requesting content list information corresponding to the terminal from the terminal, determine the content list information corresponding to the terminal from the cached plurality of content based on the message for requesting the content list information, transmit the determined content list information to the terminal, receive a playback request message for at least one content selected based on the content list information from the terminal, and provide data about the at least one content to the terminal based on the playback request message.

[0196] According to various embodiments, the processor may be further configured to execute the plurality of instructions to store location information of a streamer terminal that provides the plurality of content related to the streaming service, in response to a domain name system (DNS) request of the streamer terminal.

[0197] According to various embodiments, the message for requesting the content list information may include information about at least one of a location of the terminal, a direction of a camera of the terminal, or a field of view (FOV) of the camera of the terminal.

[0198] According to various embodiments, the processor may be further configured to execute the plurality of instructions to determine the content list information corresponding to the terminal, based on information included in the message for requesting the content list information and the location information of the streamer terminal.

[0199] According to various embodiments, the processor may be further configured to execute the plurality of instructions to determine whether the streamer terminal is included in a visual field of the camera of the terminal, based on the location of the terminal, the direction of the camera of the terminal, the FOV of the camera of the terminal, and the location information of the streamer terminal, and generate the content list information by displaying an icon related to the plurality of content provided by the streamer terminal, at a location of the streamer terminal on a 2D plane onto which the visual field of the camera of the terminal is projected, based on a determination result.

[0200] According to various embodiments, the playback request message may include information about a network state of the terminal or a requirement of the terminal, wherein the requirement of the terminal includes information about at least one of a format, a codec, or a resolution of content played by the terminal.

[0201] According to various embodiments, the processor may be further configured to execute the plurality of instructions to perform transcoding on the at least one content, based on information included in the playback request message, and transmit the data about the at least one content on which the transcoding is performed to the terminal.

[0202] According to various embodiments, a terminal for receiving a streaming service from an edge data network may include a communicator; a memory configured to store a plurality of instructions; and a processor configured to execute the plurality of instructions to transmit a message for requesting content list information corresponding to the terminal to the edge data network, receive the content list information corresponding to the terminal determined from a plurality of cached content related to the streaming service from the edge data network, transmit a playback request message for at least one content selected based on the content list information to the edge data network, and receive data about the at least one content from the edge data network.

[0203] According to various embodiments, the message for requesting the content list information may include information about at least one of a location of the terminal, a direction of a camera of the terminal, or a field of view (FOV) of the camera of the terminal.

[0204] According to various embodiments, the playback request message may include information about a network state of the terminal or a requirement of the terminal, wherein the requirement of the terminal includes information about at least one of a format, a codec, or a resolution of content played by the terminal.

[0205] Methods according to embodiments of the disclosure described in the claims or specification may be implemented in a form of hardware, software, or a combination of hardware and software.

[0206] When the methods are implemented as software, a computer-readable storage medium or a computer program product storing one or more programs (software modules) may be provided. The one or more programs stored in the computer-readable storage medium or the computer program product are configured to be executed by one or more processors in an electronic device. The one or more programs include instructions for allowing the electronic device to perform the methods according to the embodiments of the disclosure described in the claims or specification.

[0207] Such programs (software modules or software) may be stored in a random-access memory (RAM), a non-volatile memory including a flash memory, a read-only memory (ROM), an electrically erasable programmable read-only memory (EEPROM), a magnetic disc storage device, a compact disc-ROM (CD-ROM), a digital versatile disc (DVD) or another type of optical storage device, or a magnetic cassette. Alternatively, the programs may be stored in a memory combined by combining some or all of the them. Also, each configured memory may include a plurality of memories.

[0208] Also, the programs may be stored in an attachable storage device accessible through a communication network such as the Internet, an intranet, a local area network (LAN), a wide LAN (WLAN), or a storage area network (SAN), or a combination thereof. The storage device may access a device for performing embodiments of the disclosure through an external port. Also, a separate storage device on

a communication network may access the device for performing embodiments of the disclosure.

[0209] The term "computer program product" or "computer-readable medium" used herein may be used to collectively refer to a medium such as a memory, a hard disk mounted on a hard disk drive, and a signal. The "computer program product" or "computer-readable recording medium" refers to a configuration for providing, to a computer system, software including instructions for caching a plurality of content related to a streaming service, receiving a message for requesting content list information corresponding to a terminal from the terminal, determining the content list information corresponding to the terminal from the cached plurality of content based on the message for requesting the content list information, transmitting the determined content list information to the terminal, receiving a playback request message for at least one content selected based on the content list information from the terminal, and providing data about the at least one content to the terminal based on the playback request message according to the disclosure.

[0210] In specific embodiments of the disclosure, components of the disclosure are expressed singular or plural according to the specific embodiments of the disclosure. However, singular or plural representations are selected appropriately for the sake of convenience of explanation, the disclosure is not limited to singular or plural constituent elements, and even expressed as a singular element, it may be composed of plural elements, and vice versa.

[0211] Embodiments of the disclosure provide an apparatus and method capable of effectively providing a MEC-based streaming service.

[0212] While the disclosure has been illustrated and described with reference to various example embodiments, it will be understood that the various example embodiments are intended to be illustrative, not limiting. It will be further understood by one of ordinary skill in the art that various changes in form and detail may be made without departing from the true spirit and full scope of the disclosure, including the appended claims and equivalents thereof.

What is claimed is:

1. A method, performed by an edge data network, of providing a streaming service to a terminal, the method comprising:

caching a plurality of content related to the streaming service;

receiving, from the terminal, a message for requesting content list information corresponding to the terminal;

determining the content list information corresponding to the terminal from the cached plurality of content, based on the message for requesting the content list information;

transmitting the determined content list information to the terminal;

receiving, from the terminal, a playback request message for at least one content selected based on the content list information; and

providing, to the terminal, data about the at least one content, based on the playback request message.

2. The method of claim **1**, further comprising storing location information of a streamer terminal that provides the plurality of content related to the streaming service, in response to a domain name system (DNS) request of the streamer terminal.

3. The method of claim **2**, wherein the message for requesting the content list information comprises information about at least one of a location of the terminal, a direction of a camera of the terminal, or a field of view (FOV) of the camera of the terminal.

4. The method of claim **3**, wherein the determining of the content list information corresponding to the terminal from the cached plurality of content comprises determining the content list information corresponding to the terminal, based on information included in the message for requesting the content list information and the location information of the streamer terminal.

5. The method of claim **4**, wherein the determining of the content list information corresponding to the terminal comprises:

determining whether the streamer terminal is included in a visual field of the camera of the terminal, based on the location of the terminal, the direction of the camera of the terminal, the FOV of the camera of the terminal, and the location information of the streamer terminal;

generating the content list information by displaying an icon related to the plurality of content provided by the streamer terminal, at a location of the streamer terminal on a two-dimensional (2D) plane onto which the visual field of the camera of the terminal is projected, based on a determination result.

6. The method of claim **1**, wherein the playback request message comprises information about a network state of the terminal or a requirement of the terminal,

wherein the requirement of the terminal comprises information about at least one of a format, a codec, or a resolution of content playable by the terminal.

7. The method of claim **6**, wherein the providing of the data about the at least one content to the terminal comprises:

performing transcoding on the at least one content, based on the information included in the playback request message; and

transmitting the data about the at least one content on which the transcoding is performed to the terminal.

8. An operating method of a terminal for receiving a streaming service from an edge data network, the operating method comprising:

transmitting, to the edge data network, a message for requesting content list information corresponding to the terminal

receiving, from the edge data network, the content list information corresponding to the terminal determined from a plurality of cached content related to the streaming service;

transmitting, to the edge data network, a playback request message for at least one content selected based on the content list information; and

receiving data about the at least one content, from the edge data network.

9. The operating method of claim **8**, wherein the message for requesting the content list information comprises information about at least one of a location of the terminal, a direction of a camera of the terminal, or a field of view (FOV) of the camera of the terminal.

10. The operating method of claim **8**, wherein the playback request message comprises information about a network state of the terminal or a requirement of content played by the terminal,

wherein the requirement comprises information about at least one of a format, a codec, or a resolution of the content playable by the terminal.

11. An edge data network for providing a streaming service to a terminal, the edge data network comprising:

a communicator;

a memory storing a plurality of instructions; and

a processor configured to execute the plurality of instructions to:

cache a plurality of content related to the streaming service,

receive, from the terminal, a message for requesting content list information corresponding to the terminal,

determine the content list information corresponding to the terminal, from the cached plurality of content, based on the message for requesting the content list information,

transmit the determined content list information to the terminal,

receive, from the terminal, a playback request message for at least one content selected based on the content list information, and

provide, to the terminal, data about the at least one content, based on the playback request message.

12. The edge data network of claim **11**, wherein the processor is further configured to execute the plurality of instructions to store location information of a streamer terminal that provides the plurality of content related to the streaming service, in response to a domain name system (DNS) request of the streamer terminal.

13. The edge data network of claim **12**, wherein the message for requesting the content list information comprises information about at least one of a location of the terminal, a direction of a camera of the terminal, or a field of view (FOV) of the camera of the terminal.

14. The edge data network of claim **13**, wherein the processor is further configured to execute the plurality of instructions to determine the content list information corresponding to the terminal, based on information included in the message for requesting the content list information and the location information of the streamer terminal.

15. The edge data network of claim **14**, wherein the processor is further configured to execute the plurality of instructions to:

determine whether the streamer terminal is included in a visual field of the camera of the terminal, based on the location of the terminal, the direction of the camera of the terminal, the FOV of the camera of the terminal, and the location information of the streamer terminal, and

generate the content list information by displaying an icon related to the plurality of content provided by the streamer terminal, at a location of the streamer terminal on a two-dimensional (2D) plane onto which the visual field of the camera of the terminal is projected, based on a determination result.

16. The edge data network of claim **11**, wherein the playback request message comprises information about a network state of the terminal or a requirement of the terminal,

wherein the requirement of the terminal comprises information about at least one of a format, a codec, or a resolution of content playable by the terminal.

17. The edge data network of claim **16**, wherein the processor is further configured to execute the plurality of instructions to:

perform transcoding on the at least one content, based on the information included in the playback request message, and

transmit the data about the at least one content on which the transcoding is performed to the terminal.

18. A terminal for receiving a streaming service from an edge data network, the terminal comprising:

a communicator;

a memory storing a plurality of instructions; and

a processor configured to execute the plurality of instructions to:

transmit, to the edge data network, a message for requesting content list information corresponding to the terminal,

receive, from the edge data network, the content list information corresponding to the terminal determined from a plurality of cached content related to the streaming service,

transmit, to the edge data network, a playback request message for at least one content selected based on the content list information, and

receive data about the at least one content, from the edge data network.

19. The terminal of claim **18**, wherein the message for requesting the content list information comprises information about at least one of a location of the terminal, a direction of a camera of the terminal, or a field of view (FOV) of the camera of the terminal.

20. The method of claim **18**, wherein the playback request message comprises information about a network state of the terminal or a requirement of the terminal,

wherein the requirement of the terminal comprises information about at least one of a format, a codec, or a resolution of content playable by the terminal.

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