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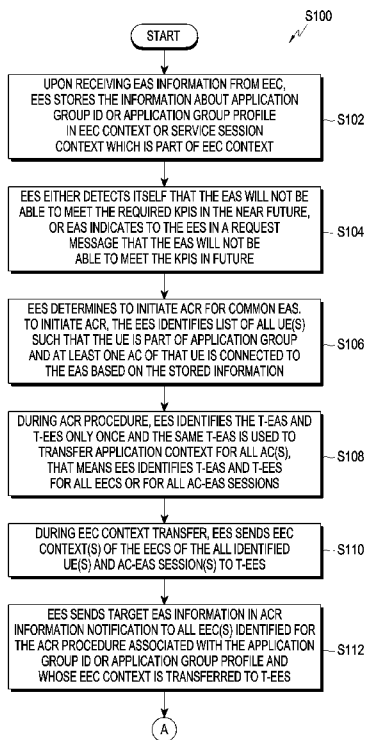
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(54) Title: METHOD AND APPARATUS FOR APPLICATION CONTEXT RELOCATION IN EDGE DATA NETWORK



(57) Abstract: The disclosure relates to a 5G or 6G communication system for supporting a higher data transmission rate. A method for application context relocation (ACR) by a source-edge application server (S-EAS) in an edge data network (EDN) is provided. The method may comprise determining to perform the ACR based on key performance indicators (KPIs) being not met; and transmitting, to a source-edge enabler server (S-EES), a request for the ACR including a list of user equipments (UEs) for the ACR.

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Description

Title of Invention: METHOD AND APPARATUS FOR APPLICATION CONTEXT RELOCATION IN EDGE DATA NETWORK

Technical Field

- [1] The present disclosure relates to wireless communication, more particularly, to performing application context relocation (ACR) in an edge data network (EDN).

Background Art

- [2] 5G mobile communication technologies define broad frequency bands such that high transmission rates and new services are possible, and can be implemented not only in "Sub 6GHz" bands such as 3.5GHz, but also in "Above 6GHz" bands referred to as mmWave including 28GHz and 39GHz. In addition, it has been considered to implement 6G mobile communication technologies (referred to as Beyond 5G systems) in terahertz bands (for example, 95GHz to 3THz bands) in order to accomplish transmission rates fifty times faster than 5G mobile communication technologies and ultra-low latencies one-tenth of 5G mobile communication technologies.
- [3] At the beginning of the development of 5G mobile communication technologies, in order to support services and to satisfy performance requirements in connection with enhanced Mobile BroadBand (eMBB), Ultra Reliable Low Latency Communications (URLLC), and massive Machine-Type Communications (mMTC), there has been ongoing standardization regarding beamforming and massive MIMO for mitigating radio-wave path loss and increasing radio-wave transmission distances in mmWave, supporting numerologies (for example, operating multiple subcarrier spacings) for efficiently utilizing mmWave resources and dynamic operation of slot formats, initial access technologies for supporting multi-beam transmission and broadbands, definition and operation of BWP (BandWidth Part), new channel coding methods such as a LDPC (Low Density Parity Check) code for large amount of data transmission and a polar code for highly reliable transmission of control information, L2 pre-processing, and network slicing for providing a dedicated network specialized to a specific service.
- [4] Currently, there are ongoing discussions regarding improvement and performance enhancement of initial 5G mobile communication technologies in view of services to be supported by 5G mobile communication technologies, and there has been physical layer standardization regarding technologies such as V2X (Vehicle-to-everything) for aiding driving determination by autonomous vehicles based on information regarding positions and states of vehicles transmitted by the vehicles and for enhancing user convenience, NR-U (New Radio Unlicensed) aimed at system operations conforming

to various regulation-related requirements in unlicensed bands, NR UE Power Saving, Non-Terrestrial Network (NTN) which is UE-satellite direct communication for providing coverage in an area in which communication with terrestrial networks is unavailable, and positioning.

- [5] Moreover, there has been ongoing standardization in air interface architecture/protocol regarding technologies such as Industrial Internet of Things (IIoT) for supporting new services through interworking and convergence with other industries, IAB (Integrated Access and Backhaul) for providing a node for network service area expansion by supporting a wireless backhaul link and an access link in an integrated manner, mobility enhancement including conditional handover and DAPS (Dual Active Protocol Stack) handover, and two-step random access for simplifying random access procedures (2-step RACH for NR). There also has been ongoing standardization in system architecture/service regarding a 5G baseline architecture (for example, service based architecture or service based interface) for combining Network Functions Virtualization (NFV) and Software-Defined Networking (SDN) technologies, and Mobile Edge Computing (MEC) for receiving services based on UE positions.
- [6] As 5G mobile communication systems are commercialized, connected devices that have been exponentially increasing will be connected to communication networks, and it is accordingly expected that enhanced functions and performances of 5G mobile communication systems and integrated operations of connected devices will be necessary. To this end, new research is scheduled in connection with eXtended Reality (XR) for efficiently supporting AR (Augmented Reality), VR (Virtual Reality), MR (Mixed Reality) and the like, 5G performance improvement and complexity reduction by utilizing Artificial Intelligence (AI) and Machine Learning (ML), AI service support, metaverse service support, and drone communication.
- [7] Furthermore, such development of 5G mobile communication systems will serve as a basis for developing not only new waveforms for providing coverage in terahertz bands of 6G mobile communication technologies, multi-antenna transmission technologies such as Full Dimensional MIMO (FD-MIMO), array antennas and large-scale antennas, metamaterial-based lenses and antennas for improving coverage of terahertz band signals, high-dimensional space multiplexing technology using OAM (Orbital Angular Momentum), and RIS (Reconfigurable Intelligent Surface), but also full-duplex technology for increasing frequency efficiency of 6G mobile communication technologies and improving system networks, AI-based communication technology for implementing system optimization by utilizing satellites and AI (Artificial Intelligence) from the design stage and internalizing end-to-end AI support functions, and next-generation distributed computing technology for implementing services at levels of complexity exceeding the limit of UE operation

capability by utilizing ultra-high-performance communication and computing resources.

- [8] In the 3rd Generation Partnership Project (3GPP), an Edge Enabler Layer (EEL) exposes Application Programming Interfaces (APIs) to support capabilities like service provisioning, registration, application server discovery, capability exposure to an Application Server (AS) and support for service continuity. Application Clients (ACs) in a UE are able to locate and connect with the most suitable EAS available in an Edge Data Network (EDN), using the capabilities provided by the EEL.
- [9] In the EEL, the EAS serves the UE in specific service area. In other words, the EAS serves the UE based on UE's location. So, either when the UE moves from one location to a new location or when the EAS is overloaded or unable to serve to the UE as per required Key Performance Indicators (KPIs), the EAS which is connected to the AC in the UE needs to be replaced with another EAS depending on service area, to provide better service experience to the user and the UE. The EEL provides service continuity feature for minimizing the application layer service interruption. In conventional method, the service continuity feature is supported by defining information elements and procedures for Application Context Relocation (ACR) procedures. The ACR procedures enable transfer of Edge Enabler Client (EEC) context from one Edge Enabler Server (EES) (i.e. a source EES or S-EES) to another EES (Target EES (T-EES)). The EAS with which the AC is connected to and receiving service in UE's current location is called as the source EAS (S-EAS). The EAS with which the AC will be connected to receive service in UE's new location is called the target EAS (T-EAS). The EES with which the EEC and S-EAS are registered is called as the source EES (S-EES). The EES with which the T-EAS is registered and EEC will be registered in order to receive service, is called as the target EES (T-EES).
- [10] Conventional methods and systems include enhanced an architecture for enabling edge applications to discover common EAS. This feature to discover common EAS enables the participants of the same application specific group to discover same common EAS where all participants within the EDN can connect. The discovery of common EAS ensures all participants of the group, connects to same application server and thus receives same service and KPIs and no other participant can get unfair advantage by connecting to different EAS. In this feature, once the common EAS is selected either by the EES or the EEC, the EES announces the common EAS for specific application group to all other EESs which supports such application group.
- [11] It is possible that the common EAS, which serves multiple UEs who are part of the same application group, may be overloaded. It is predicted (based on statistical data by an Application Data Analytics Enablement (ADAE) server or any other mechanism) that the common EAS will not be able to provide required service to the

UEs in the near future. In such cases, for all the UEs served by the common EAS, the ACR needs to be performed in order to minimize service interruption for all the UEs when common EAS is overloaded or unable to provide required services to the UE(s). The ACR procedure needs to be performed for all UEs such that all UEs remains connected to same common EAS after the service continuity. In conventional methods, the solution for service continuity for common EAS is not specified yet and so it is required to provide solution for such scenarios.

- [12] The above information is presented as background information only to help the reader to understand the present invention. Applicants have made no determination and make no assertion as to whether any of the above might be applicable as prior art with regard to the present application.

Disclosure of Invention

Solution to Problem

- [13] The principal object of the embodiments herein is to provide service continuity procedure for bulk of UE for a common EAS.
- [14] Another object of the embodiments herein is to provide performing ACR in order to minimize service interruption for all UEs when common EAS is overloaded or unable to provide required services to the UE.
- [15] According to an embodiment of the present disclosure, a method for application context relocation (ACR) by a source-edge application server (S-EAS) in an edge data network (EDN) is provided. The method may comprise determining to perform the ACR based on key performance indicators (KPIs) being not met; and transmitting, to a source-edge enabler server (S-EES), a request for the ACR including a list of user equipments (UEs) for the ACR.
- [16] According to an embodiment of the present disclosure, a method for application context relocation (ACR) by a source-edge enabler server (S-EES) in an edge data network (EDN) is provided. The method may comprise determining to perform the ACR for a source-edge application server (S-EAS); identifying a list of user equipments (UEs) of an application group connected to the S-EAS; and transmitting, to the S-EAS, an ACR management notification to start application context transfer (ACT) between the S-EAS and a target-EAS (T-EAS), wherein the ACR management notification includes a list of UEs for the ACT.
- [17] According to an embodiment of the present disclosure, a source-edge application server (S-EAS) for application context relocation (ACR) in an edge data network (EDN) is provided. The S-EAS may comprise a transceiver; and at least one processor coupled to the transceiver. The at least one processor may be configured to determine to perform the ACR based on key performance indicators (KPIs) being not met, and

transmit, to a source-edge enabler server (S-EES), a request for the ACR including a list of user equipments (UEs) for the ACR.

- [18] These and other aspects of the embodiments herein will be better appreciated and understood when considered in conjunction with the following description and the accompanying drawings. It should be understood, however, that the following descriptions, while indicating preferred embodiments and numerous specific details thereof, are given by way of illustration and not of limitation. Many changes and modifications may be made within the scope of the embodiments herein without departing from the scope thereof, and the embodiments herein include all such modifications.

Brief Description of Drawings

- [19] These and other features, aspects, and advantages of the present disclosure are illustrated in the accompanying drawings, throughout which like reference letters indicate corresponding parts in the various figures. The embodiments herein will be better understood from the following description with reference to the drawings, in which:
- [20] FIG. 1A and FIG. 1B are flow charts illustrating service continuity procedure for bulk of UE for common EAS, according to the embodiment as disclosed herein.
- [21] FIG. 2 shows various hardware components of an EES, according to the embodiments as disclosed herein.
- [22] It may be noted that to the extent possible, like reference numerals have been used to represent like elements in the drawing. Further, those of ordinary skill in the art will appreciate that elements in the drawing are illustrated for simplicity and may not have been necessarily drawn to scale. For example, the dimension of some of the elements in the drawing may be exaggerated relative to other elements to help to improve the understanding of aspects of the invention. Furthermore, the elements may have been represented in the drawing by conventional symbols, and the drawings may show only those specific details that are pertinent to the understanding the embodiments of the invention so as not to obscure the drawing with details that will be readily apparent to those of ordinary skill in the art having benefit of the description herein.

Mode for the Invention

- [23] The embodiments herein and the various features and advantageous details thereof are explained more fully with reference to the non-limiting embodiments that are illustrated in the accompanying drawings and detailed in the following description. Descriptions of well-known components and processing techniques are omitted so as to not unnecessarily obscure the embodiments herein. Also, the various embodiments described herein are not necessarily mutually exclusive, as some embodiments can

be combined with one or more other embodiments to form new embodiments. The term "or" as used herein, refers to a non-exclusive or, unless otherwise indicated. The examples used herein are intended merely to facilitate an understanding of ways in which the embodiments herein can be practiced and to further enable those skilled in the art to practice the embodiments herein. Accordingly, the examples should not be construed as limiting the scope of the embodiments herein.

[24] As is traditional in the field, embodiments may be described and illustrated in terms of blocks which carry out a described function or functions. These blocks, which may be referred to herein as managers, units, modules, hardware components or the like, are physically implemented by analog and/or digital circuits such as logic gates, integrated circuits, microprocessors, microcontrollers, memory circuits, passive electronic components, active electronic components, optical components, hardwired circuits and the like, and may optionally be driven by firmware and software. The circuits may, for example, be embodied in one or more semiconductor chips, or on substrate supports such as printed circuit boards and the like. The circuits constituting a block may be implemented by dedicated hardware, or by a processor (e.g., one or more programmed microprocessors and associated circuitry), or by a combination of dedicated hardware to perform some functions of the block and a processor to perform other functions of the block. Each block of the embodiments may be physically separated into two or more interacting and discrete blocks without departing from the scope of the disclosure. Likewise, the blocks of the embodiments may be physically combined into more complex blocks without departing from the scope of the disclosure.

[25] Embodiments disclosed herein provides a system and method for performing service continuity procedure for bulk of UE for common EAS. The present method includes upon receiving an EAS information from an EEC, an EES stores the information about application group ID or application group profile in EEC context or service session context which is part of EEC context. When the EAS is not able to meet the required KPIs, the EES performs an ACR for all the UEs which are part of same application group or at least one AC of the UE is connected to the same EAS. During the ACR procedure, the EES identifies the T-EAS and T-EES for all the EECs or for all AC-EAS sessions. Also the proposed method includes, the EES sends the EEC context of the EECs of all the UEs and AC-EAS sessions to a T-EES. The S-EES sends an ACR management notification to the S-EAS to start Application Context Transfer (ACT). Once the ACT is completed from the S-EAS to the T-EAS, both S-EAS and T-EAS sends an ACT completion notification to the S-EES and T-EES respectively. The EES sends an ACR complete notification to the EECs of all the UEs which are part of same application group or at least one AC of the UE is connected to the same EAS.

- [26] In conventional method, the EEC is registered with EES #A. When EES#A receives an EAS discovery message from the EEC for application group ID and when the common EAS for the application group ID is already available then, the EES #A provides the EAS ID for common EAS along with EES endpoint (of EES #B) details where the common EAS is registered.
- [27] The proposed method can be used to perform the ACR in order to minimize service interruption for all UEs when the common EAS is overloaded or unable to provide required services to the UE. Without the proposed method, the ACR procedure for service continuity will be performed one by one for all UEs connected to common EAS, thus, some of the UEs may get unfair advantage by connected to superior EAS (having higher compute capabilities). The proposed method ensures that all UEs connected to common EAS still remains connected to single/common EAS even after the service continuity procedure.
- [28] Referring now to the drawing, and more particularly to FIGS. 1A and 2 where similar reference characters denote corresponding features consistently throughout the figures, there are shown preferred embodiments.
- [29] FIG. 1A and FIG. 1B are flow charts (S100) illustrating service continuity procedure for bulk of UE for common EAS, according to the embodiment as disclosed herein. In description, EES #B is referred as EES or S-EES and common EAS is referred as EAS or S-EAS. At step S102, in an EAS discovery response, when the EEC received an EAS ID along with EES endpoint details, the EEC performs required procedures like EEC registration, EAS discovery and EAS information provisioning. The EAS information provisioning request includes the common EAS, application group ID or application group profile and UE identifier. The EES stores the information about application group ID or application group profile in EEC context or service session context which is part of EEC context. In an embodiment, the EES receives application group ID or application group profile information in EEC registration or EAS discovery or any other message from EEC to EES.
- [30] At step S104, the S-EES either detects itself that the S-EAS will not be able to meet the required KPIs in the near future, or the S-EAS indicates to the S-EES in a request message that the S-EAS will not be able to meet the KPIs in future. The indication from the S-EAS can be application group ID or the group profile or the list of UEs which are currently served by the common EAS or any other information elements (IE) or flag.
- [31] In an embodiment, the S-EAS can also detect by itself that the S-EAS will not be able to meet the required KPIs in the future. In an embodiment, the S-EAS initiates ACR launching procedure with the ACR determination to indicate the S-EES that the S-EAS will not be able to meet the KPIs in future. In an embodiment, the S-EAS sends

selected T-EAS declaration message to indicate the S-EES that the S-EAS will not be able to meet the KPIs in future. The indication from the S-EAS can be application group ID or the group profile or the list of UEs which are currently served by the common EAS or any other information elements (IE) or flag. In an embodiment, the S-EES or the S-EAS determines that the S-EAS will not be able to meet the KPIs in future based on analytics data received from Application Data Analytics Enablement (ADAE) service. In an embodiment, Application service provider (ASP) can provide T-EAS information to S-EAS and S-EAS can provide T-EAS to the S-EES in the request message.

- [32] At step S106, the S-EES determines to initiate ACR for the S-EAS which is a common EAS for an application group. To initiate the ACR, the S-EES identifies list of all UE(s) such that the UE is part of application group and at least one AC of that UE is connected to the S-EAS based on the stored information. In an embodiment, the S-EAS provides list of all UE(s), which are part of the application group and at least one AC of that UE is connected to the EAS, in the ACR launching procedure or in the selected T-EAS declaration message or in the EAS discovery procedure.
- [33] At step S108, during the ACR procedure, based on the UE location and EAS service area, the S-EES identifies the T-EAS and T-EES only once using Discover T-EAS and Retrieve T-EES procedures, and the same T-EAS is used to transfer application context for all the AC(s) that means the EES identifies the T-EAS and T-EES using Discover T-EAS and Retrieve T-EES procedures for all the EECs or for all AC-EAS sessions. The S-EES determines all the EECs whose context needs to be transferred to the T-EES. Application context for AC in these UE(s) will be transferred to the T-EAS.
- [34] At step S110, during EEC context transfer using EEC Context Push relocation procedure, the S-EES sends the EEC context(s) of the EECs of the all identified UE(s) and AC-EAS session(s), the application group id or application group profile to the T-EES. The EEC context includes application group id or application group profile, selected ACR scenarios, etc.
- [35] At step S112, The S-EES sends target EAS information in ACR information notification to all the EEC(s) identified for the ACR procedure associated with the application group ID or application group profile and whose EEC context is transferred to the T-EES. The notification message includes an indication to the EEC indicating that the T-EAS is a common EAS for the application group ID or application group profile.
- [36] At step S114, the S-EES sends the ACR management notification to S-EAS to start Application Context Transfer (ACT). The notification includes indication to start ACT for all application contexts of all ACs for the identified UE(s) which are member of

the provided application group Id and application group profile. In an embodiment, the notification message to the S-EAS includes list of all UE(s) which are part of the application group and at least one AC of that UE is connected to the EAS.

[37] At step S116, once application context transfer for all ACs is completed from the S-EAS to the T-EAS, both S-EAS and T-EAS sends ACT status notification to the S-EES and the T-EES respectively. The notification includes list of all UE identifiers or EEC IDs whose application context is successfully transferred. The notification may also include application group Id and application group profile. In an embodiment, the notification includes list of all UE identifiers or EEC IDs whose application context is failed to transfer.

[38] At step S118, the S-EES sends ACR complete notification to all EEC(s) identified for the ACR procedure associated with the application group ID or application group profile and whose EEC context is transferred to the T-EES.

[39] In an embodiment, the service continuity procedure for bulk of UE for common EAS is applicable for the deployment with central repository or deployment without central repository.

[40] FIG. 2 shows various hardware components of the EES (100), according to the embodiments as disclosed herein. In an embodiment, the EES (100) includes a processor (110), a communicator (120), a memory (130) and a service continuity procedure controller (140). The processor (110) is coupled with the communicator (120), the memory (130) and the service continuity procedure controller (140).

[41] The service continuity procedure controller (140) stores the information about at least one of: the application group ID, the application group profile in the EEC context, and the service session context, upon receiving the EAS information from the EEC. The service session context is part of the EEC context. Further, the service continuity procedure controller (140) detects that the EAS does not able to meet required KPIs in a near future or the EAS indicates to the EES (100) in the request message that the EAS does not able to meet the KPI in future. The request includes the list of UEs currently connecting with common EAS to take the service for which the ACR is required. Further, the service continuity procedure controller (140) determines to initiate ACR procedure for common EAS based on the detection. The ACR for the common EAS is initiated by identifying the list of all UEs such that all UEs are part of the application group and at least one AC of that the at least one UE is connected to the EAS based on the stored information.

[42] Further, the service continuity procedure controller (140) identifies the T-EAS and the T-EES for all EECs or for all session between the AC and the EAS during the ACR procedure. The T-EAS is used to transfer application context for all ACs. Further, the service continuity procedure controller (140) sends the at least one EEC context of the

all EECs of all identified UEs or the AC-EAS session to the T-EES during an EEC context transfer based on the identification.

[43] Further, the service continuity procedure controller (140) sends the target EAS information in the ACR information notification to all EECs identified for the ACR procedure associated with the application group ID or the application group profile, when the EEC context is transferred to the T-EES. Further, the service continuity procedure controller (140) sends the ACR complete notification to all EECs identified for the ACR procedure associated with the application group ID or the application group profile based on the target EAS information.

[44] In an embodiment, the service continuity procedure controller (140) sends the ACR management notification to the S-EAS to start application context transfer. Further, the service continuity procedure controller (140) receives the ACT status notification from the S-EAS once the application context transfer is completed from the S-EAS to the T-EAS. Further, the service continuity procedure controller (140) sends the ACR complete notification to all EECs identified for the ACR procedure associated with the application group ID or the application group profile whose EEC context is transferred to the T-EES.

[45] The service continuity procedure controller (140) is implemented by analog and/or digital circuits such as logic gates, integrated circuits, microprocessors, microcontrollers, memory circuits, passive electronic components, active electronic components, optical components, hardwired circuits and the like, and may optionally be driven by firmware.

[46] The processor (110) may include one or a plurality of processors. The one or the plurality of processors may be a general-purpose processor, such as a central processing unit (CPU), an application processor (AP), or the like, a graphics-only processing unit such as a graphics processing unit (GPU), a visual processing unit (VPU), and/or an AI-dedicated processor such as a neural processing unit (NPU). The processor (110) may include multiple cores and is configured to execute the instructions stored in the memory (130). The service continuity procedure controller (140) and the processor (110) may be integrally referred to as at least one processor.

[47] Further, the processor (110) is configured to execute instructions stored in the memory (130) and to perform various processes. The communicator (120) is configured for communicating internally between internal hardware components and with external devices via one or more networks. The memory (130) also stores instructions to be executed by the processor (110). The memory (130) may include non-volatile storage elements. Examples of such non-volatile storage elements may include magnetic hard discs, optical discs, floppy discs, flash memories, or forms of electrically programmable memories (EPROM) or electrically erasable

and programmable (EEPROM) memories. In addition, the memory (130) may, in some examples, be considered a non-transitory storage medium. The term "non-transitory" may indicate that the storage medium is not embodied in a carrier wave or a propagated signal. However, the term "non-transitory" should not be interpreted that the memory (130) is non-movable. In certain examples, a non-transitory storage medium may store data that can, over time, change (e.g., in Random Access Memory (RAM) or cache).

[48] In an embodiment, the communicator (120) includes an electronic circuit specific to a standard that enables wired or wireless communication. The communicator (120) is configured to communicate internally between internal hardware components of the user equipment (100) and with external devices via one or more networks. The communicator (120) may be referred to as a transceiver.

[49] Although the FIG. 2 shows various hardware components of the EES (100) but it is to be understood that other embodiments are not limited thereon. In other embodiments, the EES (100) may include less or more number of components. Further, the labels or names of the components are used only for illustrative purpose and does not limit the scope of the invention. One or more components can be combined together to perform same or substantially similar function in the EES (100).

[50] An apparatus of an entity other than the EES (100) (e.g. EAS, or EEC) may include a processor, communicator, a memory and a service continuity procedure controller, described similarly as the EES (100) regarding FIG. 2.

[51] The various actions, acts, blocks, steps, or the like in the flow chart (S100) may be performed in the order presented, in a different order or simultaneously. Further, in some embodiments, some of the actions, acts, blocks, steps, or the like may be omitted, added, modified, skipped, or the like without departing from the scope of the invention.

[52] The foregoing description of the specific embodiments will so fully reveal the general nature of the embodiments herein that others can, by applying current knowledge, readily modify and/or adapt for various applications such specific embodiments without departing from the generic concept, and, therefore, such adaptations and modifications should and are intended to be comprehended within the meaning and range of equivalents of the disclosed embodiments. It is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation. Therefore, while the embodiments herein have been described in terms of preferred embodiments, those skilled in the art will recognize that the embodiments herein can be practiced with modification within the scope of the embodiments as described herein.

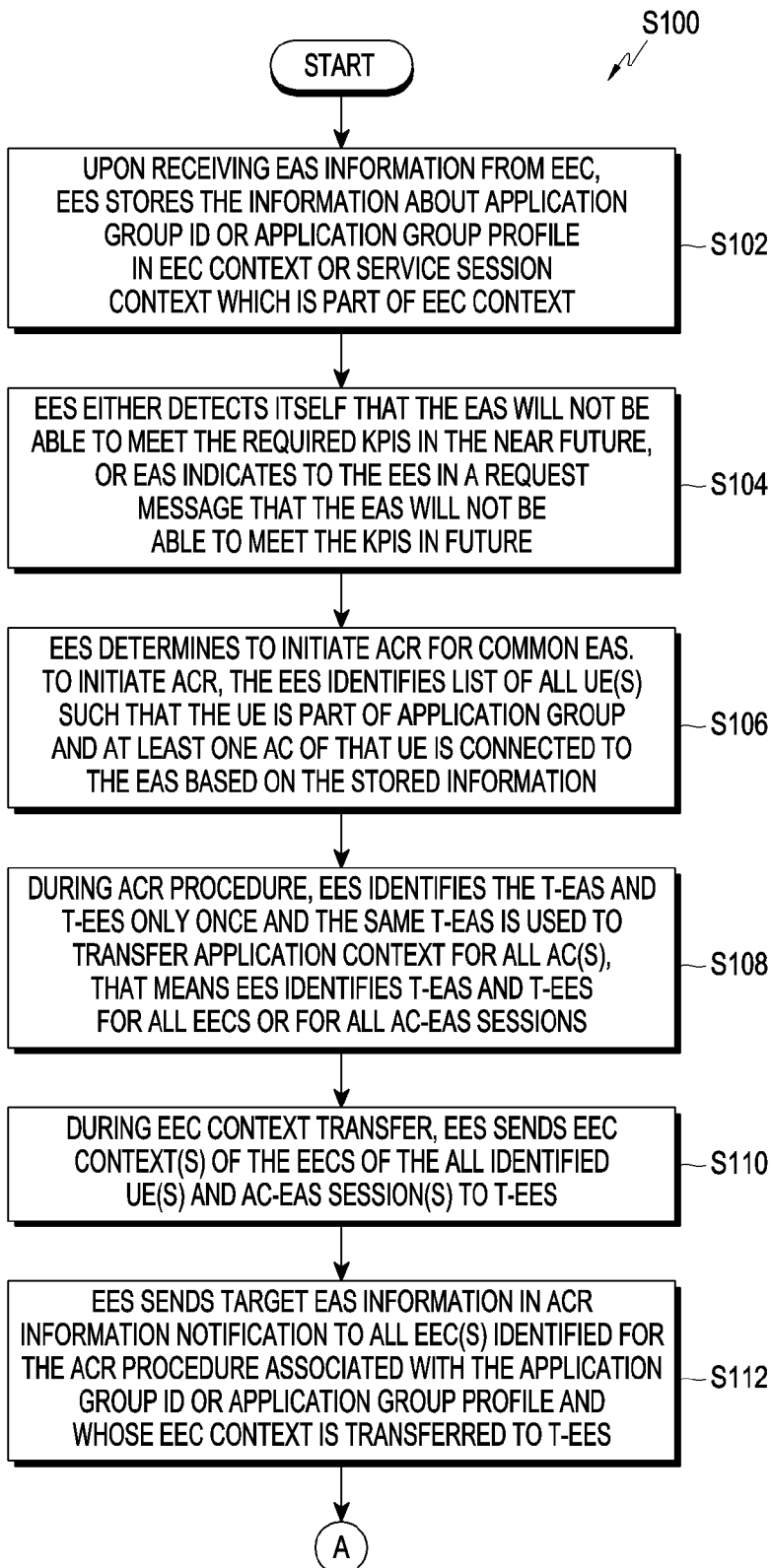
Claims

- [Claim 1] A method for application context relocation (ACR) by a source-edge application server (S-EAS) in an edge data network (EDN), the method comprising:
determining to perform the ACR based on key performance indicators (KPIs) being not met; and
transmitting, to a source-edge enabler server (S-EES), a request for the ACR including a list of user equipments (UEs) for the ACR.
- [Claim 2] The method of claim 1, further comprising:
receiving, from the S-EES, an ACR management notification to start application context transfer (ACT) between the S-EAS and a target-EAS (T-EAS), wherein the ACR management notification includes a list of UEs for the ACT; and
performing the ACT to the T-EAS for the list of UEs for the ACT.
- [Claim 3] The method of claim 2, further comprising:
transmitting, to the S-EES, a message related to ACT status including a list of UE identifiers.
- [Claim 4] The method of claim 1, further comprising:
transmitting, to the S-EES, target-EAS (T-EAS) information.
- [Claim 5] The method of claim 1, wherein the S-EAS is a common EAS for an application group.
- [Claim 6] A method for application context relocation (ACR) by a source-edge enabler server (S-EES) in an edge data network (EDN), the method comprising:
determining to perform the ACR for a source-edge application server (S-EAS);
identifying a list of user equipments (UEs) of an application group connected to the S-EAS; and
transmitting, to the S-EES, an ACR management notification to start application context transfer (ACT) between the S-EAS and a target-EAS (T-EAS), wherein the ACR management notification includes a list of UEs for the ACT.
- [Claim 7] The method of claim 6, further comprising:
performing EEC context push relocation for edge enabler clients (EECs) in the UEs for the application group.
- [Claim 8] The method of claim 6, further comprising:

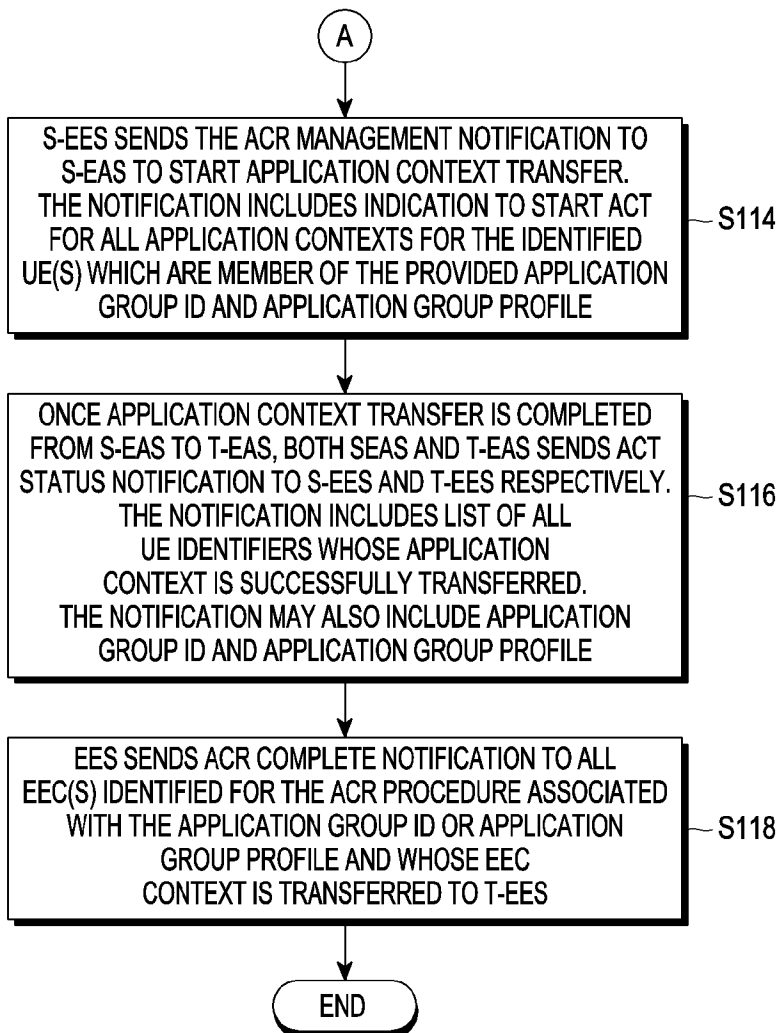
- receiving, from the S-EAS, a request for the ACR including a list of UEs for the ACR,
wherein to perform the ACR for the S-EAS is determined based on the received request for the ACR.
- [Claim 9] The method of claim 6, further comprising:
detecting that the ACR is required based on analytics data from application data analytics enablement (ADAE) server,
wherein to perform the ACR for the S-EAS is determined based on detecting that the ACR is required based on the analytics data from the ADAE server.
- [Claim 10] The method of claim 6, further comprising:
receiving, from the S-EAS, a message related to ACT status including a list of UE identifiers.
- [Claim 11] The method of claim 6, further comprising:
transmitting, to at least one edge enabler client (EEC) of at least one UE for which the ACR is completed, a ACR complete notification.
- [Claim 12] The method of claim 6, further comprising:
receiving, from the S-EAS, target-EAS (T-EAS) information; and
transmitting, to at least one edge enabler client (EEC) of at least one UE identified for the ACR, the target-EAS (T-EAS) information.
- [Claim 13] The method of claim 6, wherein the S-EAS is a common EAS for an application group.
- [Claim 14] A source-edge application server (S-EAS) for application context relocation (ACR) in an edge data network (EDN), the S-EAS comprising:
a transceiver; and
at least one processor coupled to the transceiver, wherein at least one processor is configured to:
determine to perform the ACR based on key performance indicators (KPIs) being not met, and
transmit, to a source-edge enabler server (S-EES), a request for the ACR including a list of user equipments (UEs) for the ACR.
- [Claim 15] The S-EAS of claim 14, wherein the at least one processor is further configured to:
receive, from the S-EES, an ACR management notification to start application context transfer (ACT) between the S-EAS and a

target-EAS (T-EAS), wherein the ACR management notification includes a list of UEs for the ACT; and perform the ACT to the T-EAS for the list of UEs for the ACT.

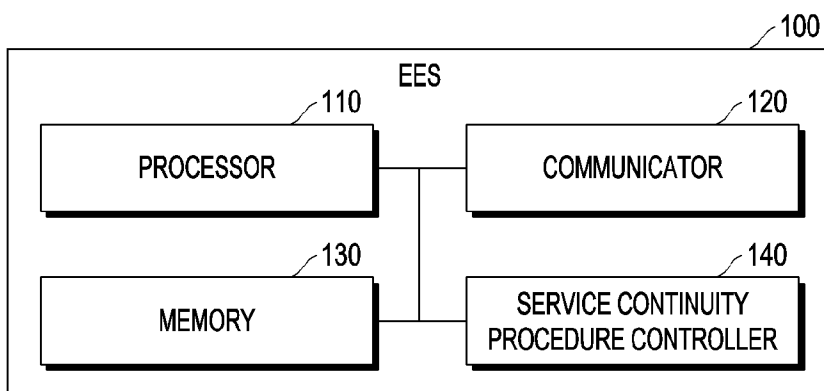
[Fig. 1A]



[Fig. 1B]



[Fig. 2]



INTERNATIONAL SEARCH REPORT

International application No.

PCT/KR2024/008970

A. CLASSIFICATION OF SUBJECT MATTER		
H04L 67/1001(2022.01)i; H04L 67/148(2022.01)i; H04L 67/306(2022.01)i; H04L 41/5009(2022.01)i		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED		
Minimum documentation searched (classification system followed by classification symbols) H04L 67/1001(2022.01); H04L 65/401(2022.01); H04L 67/10(2022.01); H04L 67/148(2022.01); H04L 67/289(2022.01); H04L 67/63(2022.01); H04W 60/06(2009.01); H04W 8/02(2009.01); H04W 8/22(2009.01)		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Korean utility models and applications for utility models Japanese utility models and applications for utility models		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) eKOMPASS(KIPO internal) & Keywords: application context relocation (ACR), source edge application server (S-EAS), edge enabler server (EES), application context transfer		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2023-0053805 A1 (SAMSUNG ELECTRONICS CO., LTD.) 23 February 2023 (2023-02-23) paragraphs [0013], [0071]-[0076], [0078]	1-15
Y	3GPP; TSG SA; Study on enhanced Architecture for enabling Edge Applications; (Release 18), 3GPP TR 23.700-98 V18.1.0, 31 March 2023 pages 81, 92, 107, 109, 116, 127, 166, 175, 207, 236	1-15
A	WO 2023-027477 A1 (SAMSUNG ELECTRONICS CO., LTD.) 02 March 2023 (2023-03-02) paragraphs [0080]-[0098]; and figure 2	1-15
A	WO 2023-039409 A1 (CONVIDA WIRELESS, LLC) 16 March 2023 (2023-03-16) claims 1-2	1-15
A	WO 2023-003686 A1 (INTEL CORPORATION) 26 January 2023 (2023-01-26) paragraphs [0223]-[0224]; and figure 15	1-15
<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex.		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "D" document cited by the applicant in the international application "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search 30 September 2024		Date of mailing of the international search report 30 September 2024
Name and mailing address of the ISA/KR Korean Intellectual Property Office 189 Cheongsa-ro, Seo-gu, Daejeon 35208, Republic of Korea Facsimile No. +82-42-481-8578		Authorized officer YANG, Jeong Rok Telephone No. +82-42-481-5709

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No. PCT/KR2024/008970

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US	2023-0053805	A1	23 February 2023	CN	114902711	A	12 August 2022
				EP	4061033	A1	21 September 2022
				KR	10-2021-0087881	A	13 July 2021
				KR	10-2428236	B1	04 August 2022
				WO	2021-137579	A1	08 July 2021

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WO	2023-039409	A1	16 March 2023	CN	118160290	A	07 June 2024
				EP	4393142	A1	03 July 2024

WO	2023-003686	A1	26 January 2023	US	2024-0147404	A1	02 May 2024
