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(71) Applicant: **NOKIA SOLUTIONS AND NETWORKS OY** [FI/FI]; Karaportti 3, 02610 Espoo (FI).

(72) Inventor: **MILINSKI, Alexander**; Würzstraße 7, 81371 München (DE).

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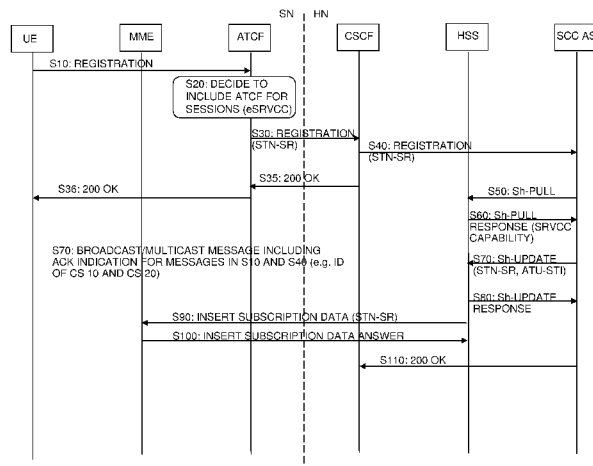


FIG. 2

(57) **Abstract:** A method including conducting a registration procedure for a communication element for acquiring packet switched connectivity in a communication network via an IP multimedia network, wherein the communication network is configured to execute an extended call continuity procedure and a non-extended call continuity procedure for transferring access of at least one media path of the communication element from a first access domain to a second access domain; enabling the extended call continuity procedure by including an access transfer control function in a session path used for the communication element; transmitting an identifier for the access transfer control function used for directing a signaling to the access transfer control function to a call session control function of the IP multimedia network; initiating a registration of the communication element at a service continuity enabling element of the IP multimedia network; determining an access transfer information element used for directing signaling to the service continuity enabling element; and storing the access transfer information element and the identifier for the access transfer control function in association with each other in a database for subscriber information related to the communication element.

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MECHANISM FOR DOMAIN TRANSFER

DESCRIPTION

5 BACKGROUND

Field

10 The present invention relates to apparatuses, methods, systems, computer programs, computer program products and computer-readable media usable for conducting a session or domain change for a communication conducted by a communication element in a communication network, in particular in communication networks providing packet switched based access technology such as IP connectivity and circuit switched access technology, for example, Voice over IP or Voice over LTE and UMTS or the like.

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Background Art

20 The following description of background art may include insights, discoveries, understandings or disclosures, or associations, together with disclosures not known to the relevant prior art, to at least some examples of embodiments of the present invention but provided by the invention. Some of such contributions of the invention may be specifically pointed out below, whereas other of such contributions of the invention will be apparent from the related context.

25 The following meanings for the abbreviations used in this specification apply:

3GPP:	3 rd Generation Partner Project
ATCF:	access transfer control function
ATGW:	access transfer gateway
30 ATU-STI:	access transfer update session transfer identifier
BS:	base station
C-MSISDN:	correlation mobile station integrated services digital network
CPU:	central processing unit
CS:	circuit switched
35 CSCF:	call session control function

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	eNB:	evolved node B
	eSRVCC:	enhanced SRVCC
	ETSI	European Telecommunications Standards Institute
	HN:	home network
5	HSS:	home subscriber server
	I-CSCF:	interrogating CSCF
	ID:	identification, identifier
	IMS:	IP multimedia subsystem
	IP:	Internet protocol
10	IP-CAN:	IP connectivity access network
	LIA:	location information answer
	LIR:	location information request
	LTE:	Long Term Evolution
	LTE-A:	LTE Advanced
15	MGCF:	media gateway control function
	MGW:	media gateway
	MME:	mobility management element
	MSC:	mobile switching center
	NB:	node B
20	P-CSCF:	proxy CSCF
	PGW:	packet data network gateway
	PS:	packet switched
	PSI:	public service identifier
	RNC:	radio network controller
25	SCC-AS:	service centralization and continuity application server
	S-CSCF:	serving CSCF
	SGW:	serving gateway
	SIP:	session initiation protocol
	SN:	serving network
30	SRVCC:	single radio voice call continuity
	STN-SR:	session transfer number single radio
	UA:	[SIP] user agent
	UE:	user equipment
	UMTS:	universal mobile telecommunication system
35	VoIP:	voice over IP

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VoLTE: voice over LTE

Embodiments of the present invention are related to a mechanism by means of which a call continuity procedure allowing to change an access domain of a communication element such as a UE from a first domain, such as a PS domain, to a second domain, such as a legacy voice domain like a CS domain, can be successfully executed even in case of a failure situation, for example, when a control function necessary for the originally intended call continuity procedure becomes unreachable.

SUMMARY

According to an example of an embodiment, there is provided, for example, a method including

conducting a registration procedure for a communication element for acquiring packet switched connectivity in a communication network via an IP multimedia network, wherein the communication network is configured to execute an extended call continuity procedure and a non-extended call continuity procedure for transferring access of at least one media path of the communication element from a first access domain to a second access domain; enabling the extended call continuity procedure by including an access transfer control function in a session path used for the communication element; transmitting an identifier for the access transfer control function used for directing a signaling to the access transfer control function to a call session control function of the IP multimedia network; initiating a registration of the communication element at a service continuity enabling element of the IP multimedia network; determining an access transfer information element used for directing signaling to the service continuity enabling element; and storing the access transfer information element and the identifier for the access transfer control function in association with each other in a database for subscriber information related to the communication element.

Furthermore, according to an example of an embodiment, there is provided, for example, a system including a plurality of network elements or functions of a communication network, wherein the communication network is configured to execute an extended call continuity procedure and a non-extended call continuity procedure for transferring access of at least one media path of communication element, for which a registration procedure is conducted for acquiring packet switched connectivity in the communication

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network via an IP multimedia network, from a first access domain to a second access domain; wherein the plurality of network elements or functions include an access transfer control function included in a session path used for the communication element for enabling the extended call continuity procedure; a call session control function of the IP multimedia network to which an identifier for the access transfer control function used for directing a signaling to the access transfer control function is transmitted; a service continuity enabling element of the IP multimedia network configured to register the communication element, and to determine an access transfer information element used for directing signaling to the service continuity enabling element; and a database for subscriber information related to the communication element, wherein the service continuity enabling element of the IP multimedia network is further configured to store the access transfer information element and the identifier for the access transfer control function in association with each other in the database for subscriber information.

According to further refinements, these examples may include one or more of the following features:

an execution of the extended call continuity procedure for conducting an access transfer from the first access domain to the second access domain may be triggered, on the basis of the identifier for the access transfer control function, address information of the access transfer control function from the database for subscriber information may be requested, the address information of the access transfer control function may be transmitted to the call session control function of the IP multimedia network, the access transfer information element used for directing signaling to the service continuity enabling element and associated with the identifier for the access transfer control function may be requested from the database for subscriber information, and the access transfer information element used for directing signaling to the service continuity enabling element and associated with the identifier for the access transfer control function may be transmitted to the call session control function of the IP multimedia network;

the requesting of the access transfer information element used for directing signaling to the service continuity enabling element and associated with the identifier for the access transfer control function may be made at the requesting of the database for subscriber information by one of sending, with the request for the address information of the access transfer control function, an indication for an ability to change the extended call continuity procedure to a non-extended call continuity procedure, wherein the access transfer information element used for directing signaling to the

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service continuity enabling element is transmitted to the call session control function of the IP multimedia network together with the identifier for the access transfer control function, and sending a dedicated message for requesting transmission of the access transfer information element used for directing signaling to the service continuity enabling element when it is determined that the access transfer control function is not reachable, wherein the access transfer information element used for directing signaling to the service continuity enabling element is transmitted to the call session control function of the IP multimedia network in response to the dedicated message;

when executing the extended call continuity procedure, a session transfer request may be sent from the call session control function of the IP multimedia network to the access transfer control function, wherein, in case it is determined that the access transfer control function is not reachable, a processing may be changed from an execution of the extended call continuity procedure to an execution of a non-extended call continuity procedure, the session transfer request may be sent from the call session control function of the IP multimedia network to the service continuity enabling element by using the access transfer information element, and an indication for the change to the non-extended call continuity procedure may be provided to the service continuity enabling element;

at the service continuity enabling element, the session transfer request from the call session control function of the IP multimedia network regarding a session in which the access transfer control function is included may be received and processed, on the basis of the indication for the change to the non-extended call continuity procedure provided to the service continuity enabling element, it may be determined that a non-extended call continuity procedure is to be executed, and a processing for transferring the access domain from the first access domain to the second access domain without the access transfer control function may be conducted for executing the non-extended call continuity procedure;

the processing for transferring the access domain from the first access domain to the second access domain according to the non-extended call continuity procedure may further include conducting a remote leg update for changing connection to a control network element of the second access domain, and cancelling an access source leg to the access transfer control function;

the first access domain may be a packet switched access domain of the communication network, the second access domain may be a circuit switched access domain of the communication network, the extended call continuity procedure may

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include an evolved single radio voice call continuity procedure according to third generation partnership project specification, the non-extended call continuity procedure may include a single radio voice call continuity procedure according to third generation partnership project specification, the identifier for the access transfer control function used for directing a signaling to the access transfer control function may include a session transfer number – single radio element, and the access transfer information element used for directing signaling to the service continuity enabling element may include an access transfer update – session transfer identifier element;

the above described processing may be implemented in at least one network element or function of the communication network, wherein the communication element may include a user equipment configured to communicate via packet switched connectivity, the access transfer control function may include an control function located in a serving network part, the call session control function of the IP multimedia network may include one or more of an interrogating call session control function, a proxy call session control function and a serving call session control function, the service continuity enabling element of the IP multimedia network may include a service centralization and continuity application server, and the database for subscriber information related to the communication element may include a home subscriber server, wherein a control network element of the first access domain may include a mobility management element, and a control network element of the second access domain may include a mobile switching center.

Moreover, according to an example of an embodiment, there is provided, for example, a method including receiving, when conducting a registration procedure for a communication element for acquiring packet switched connectivity in a communication network via an IP multimedia network, wherein the communication network is configured to execute an extended call continuity procedure and a non-extended call continuity procedure for transferring access of at least one media path of the communication element from a first access domain to a second access domain, an identifier for an access transfer control function used for directing a signaling to the access transfer control function; initiating a registration of the communication element at a service continuity enabling element of the IP multimedia network; requesting, on the basis of the identifier for the access transfer control function, address information of the access transfer control function from a database for subscriber information, and for requesting, from the database for subscriber information, an access transfer information element

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used for directing signaling to a service continuity enabling element and associated with the identifier for the access transfer control function; and receiving the address information of the access transfer control function and the access transfer information element used for directing signaling to the service continuity enabling element and associated with the identifier for the access transfer control function.

Furthermore, according to an example of an embodiment, there is provided, for example, an apparatus including means for receiving, when conducting a registration procedure for a communication element for acquiring packet switched connectivity in a communication network via an IP multimedia network, wherein the communication network is configured to execute an extended call continuity procedure and a non-extended call continuity procedure for transferring access of at least one media path of the communication element from a first access domain to a second access domain, an identifier for an access transfer control function used for directing a signaling to the access transfer control function; means for initiating a registration of the communication element at a service continuity enabling element of the IP multimedia network; means for requesting, on the basis of the identifier for the access transfer control function, address information of the access transfer control function from a database for subscriber information, and for requesting, from the database for subscriber information, an access transfer information element used for directing signaling to a service continuity enabling element and associated with the identifier for the access transfer control function; and means for receiving the address information of the access transfer control function and the access transfer information element used for directing signaling to the service continuity enabling element and associated with the identifier for the access transfer control function.

According to further refinements, these examples may include one or more of the following features:

the requesting of the access transfer information element may include one of sending, with the request for the address information of the access transfer control function, an indication for an ability to change the extended call continuity procedure to a non-extended call continuity procedure, wherein the access transfer information element used for directing signaling to the service continuity enabling element is transmitted to the call session control function of the IP multimedia network together with the identifier for the access transfer control function, and sending a dedicated message

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for requesting transmission of the access transfer information element used for directing signaling to the service continuity enabling element when it is determined that the access transfer control function is not reachable, wherein the access transfer information element used for directing signaling to the service continuity enabling element is transmitted to the call session control function of the IP multimedia network in response to the dedicated message;

when executing the extended call continuity procedure, a session transfer request may be sent to the access transfer control function, it may be determined that the access transfer control function is not reachable, a processing may be changed from an execution of the extended call continuity procedure to an execution of a non-extended call continuity procedure, the session transfer request may be sent to the service continuity enabling element by using the access transfer information element, and an indication for the change to the non-extended call continuity procedure may be provided to the service continuity enabling element;

In addition, according to an example of an embodiment, there is provided, for example, a method including determining, when conducting a registration procedure for a communication element for acquiring packet switched connectivity in a communication network via an IP multimedia network, wherein the communication network is configured to execute an extended call continuity procedure and a non-extended call continuity procedure for transferring access of at least one media path of the communication element from a first access domain to a second access domain, an access transfer information element used for directing signaling to a service continuity enabling element; and causing storing of the access transfer information element and an identifier for an access transfer control function in association with each other in a database for subscriber information related to the communication element.

Furthermore, according to an example of an embodiment, there is provided, for example, an apparatus including means for determining, when conducting a registration procedure for a communication element for acquiring packet switched connectivity in a communication network via an IP multimedia network, wherein the communication network is configured to execute an extended call continuity procedure and a non-extended call continuity procedure for transferring access of at least one media path of the communication element from a first access domain to a second access domain, an access transfer information element used for directing signaling to a service continuity

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enabling element; and means for causing storing of the access transfer information element and an identifier for an access transfer control function in association with each other in a database for subscriber information related to the communication element.

5 According to further refinements, these examples may include one or more of the following features:

a session transfer request from a call session control function of the IP multimedia network regarding a session in which an access transfer control function is included may be received and processed, on the basis of an indication for a change to the non-extended call continuity procedure, it may be determined that a non-extended call continuity procedure is to be executed, and a processing for transferring the access domain from the first access domain to the second access domain without the access transfer control function may be conducted for executing the non-extended call continuity procedure;

10 the processing for transferring the access domain from the first access domain to the second access domain according to the non-extended call continuity procedure may further include conducting a remote leg update for changing connection to a control network element of the second access domain, and cancelling an access source leg to the access transfer control function.

20 In addition, according to embodiments, there is provided, for example, a computer program product for a computer, including software code portions for performing the steps of the above defined methods, when said product is run on the computer. The computer program product may include a computer-readable medium on which said software code portions are stored. Furthermore, the computer program product may be directly loadable into the internal memory of the computer and/or transmittable via a network by means of at least one of upload, download and push procedures.

BRIEF DESCRIPTION OF THE DRAWINGS

30 Some embodiments of the present invention are described below, by way of example only, with reference to the accompanying drawings, in which:

Fig. 1 shows a diagram illustrating a configuration of communication network environment where some examples of embodiments are implementable;

Fig. 2 shows a signaling diagram illustrating a registration processing according to some examples of embodiments;

5 Fig. 3 shows a signaling diagram illustrating an information provision processing according to some examples of embodiments;

Fig. 4 shows a signaling diagram illustrating a session transfer processing according to some examples of embodiments;

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Fig. 5 shows a flow chart of a processing conducted in a system implemented in a communication network according to some examples of embodiments;

15 Fig. 6 shows a flow chart of a processing conducted in a call session control function according to some examples of embodiments;

Fig. 7 shows a flow chart of a processing conducted in a service continuity enabling element according to some examples of embodiments;

20 Fig. 8 shows a diagram of a network element or function acting as a call session control function according to some examples of embodiments; and

Fig. 9 shows a diagram of a network element or function acting as a service continuity enabling element according to some examples of embodiments.

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DESCRIPTION OF EMBODIMENTS

In the last years, an increasing extension of communication networks, e.g. of wire based communication networks, such as the Integrated Services Digital Network (ISDN), DSL,
30 or wireless communication networks, such as the cdma2000 (code division multiple access) system, cellular 3rd generation (3G) like the Universal Mobile Telecommunications System (UMTS), fourth generation (4G) communication networks or enhanced communication networks based e.g. on LTE or LTE-A, fifth generation (5G) communication networks, cellular 2nd generation (2G) communication networks like the
35 Global System for Mobile communications (GSM), the General Packet Radio System

(GPRS), the Enhanced Data Rates for Global Evolution (EDGE), or other wireless communication system, such as the Wireless Local Area Network (WLAN), Bluetooth or Worldwide Interoperability for Microwave Access (WiMAX), took place all over the world. Various organizations, such as the European Telecommunications Standards Institute (ETSI), the 3rd Generation Partnership Project (3GPP), Telecoms & Internet converged Services & Protocols for Advanced Networks (TISPAN), the International Telecommunication Union (ITU), 3rd Generation Partnership Project 2 (3GPP2), Internet Engineering Task Force (IETF), the IEEE (Institute of Electrical and Electronics Engineers), the WiMAX Forum and the like are working on standards or specifications for telecommunication network and access environments.

Generally, for properly establishing and handling a communication connection between two end points (e.g. communication stations or elements, such as terminal devices, user equipments (UEs), or other communication network elements, a database, a server, host etc.), one or more network elements such as communication network control elements, for example access network elements like access points, radio base stations, eNBs etc., and core network elements or functions, for example control nodes, support nodes, service nodes, gateways etc., may be involved, which may belong to one communication network system or different communication network systems.

One of the major services used in mobile communication networks is voice communication. With the development of IP based and packet based networks, like 3GPP LTE networks and the like, VoIP or VoLTE is developed for providing corresponding services based on packet based communications.

LTE provides an IP mobile broadband communication access and is evolved from UMTS. LTE utilizes IP Multimedia Subsystem (IMS) to provide voice and multimedia services via the packet domain. Generally, UMTS networks provide full service coverage, while LTE networks often provide zonal coverage, compared with UMTS. Therefore, when the LTE network is available, a UE attaches to the LTE network to make an IMS call. When the LTE network becomes unavailable during an IMS call, e.g. due to movement of the UE out of coverage of the LTE network or due to other reasons, like interference, traffic load etc., the UE switches to the CS domain of the UMTS network to continue the call. This process is referred to access transfer or domain transfer for

providing call continuity. Examples of call continuity procedures are e.g. SRVCC or eSRVCC which allow to transfer an IMS call between LTE and UMTS.

5 In the following, different exemplifying embodiments will be described using, as an example of a communication network to which the embodiments may be applied, a communication network architecture based on 3GPP standards, such as UMTS, LTE or LTE-A communication networks, without restricting the embodiments to such architectures, however. It is obvious for a person skilled in the art that the embodiments may also be applied to other kinds of communication networks having suitable means by adjusting parameters and procedures appropriately, e.g. WiFi, worldwide interoperability for microwave access (WiMAX), Bluetooth®, personal communications services (PCS), ZigBee®, wideband code division multiple access (WCDMA), systems using ultra-wideband (UWB) technology, mobile ad-hoc networks (MANETs), wired access, etc.. Furthermore, without loss of generality, description of some examples of 10 embodiments is related to a call continuity procedure such as SRVCC or eSRVCC, but principles of the invention can be extended and applied to any other type of call continuity procedure, for example vSRVCC (video SRVCC) or another procedure having a corresponding configuration.

20 The following examples and embodiments are to be understood only as illustrative examples. Although the specification may refer to “an”, “one”, or “some” example(s) or embodiment(s) in several locations, this does not necessarily mean that each such reference is related to the same example(s) or embodiment(s), or that the feature only applies to a single example or embodiment. Single features of different embodiments may also be combined to provide other embodiments. Furthermore, terms like “comprising” and “including” should be understood as not limiting the described 25 embodiments to consist of only those features that have been mentioned; such examples and embodiments may also contain features, structures, units, modules etc. that have not been specifically mentioned.

30 A basic system architecture of a telecommunication network including a communication system where some examples of embodiments are applicable may include an architecture of one or more communication networks including a wired or wireless access network subsystem and a core network. Such an architecture may include one or more 35 communication network control elements, access network elements, radio access

network elements, access service network gateways or base transceiver stations, such as a base station (BS), an access point (AP), a NodeB (NB) or an eNB, which control a respective coverage area or cell(s) and with which one or more communication stations such as communication elements, user devices or terminal devices, like a UE or a vehicle, or another device having a similar function, such as a modem chipset, a chip, a module etc., which can also be part of a station, an element, a function or an application capable of conducting a communication, such as a UE, an element or function usable in a machine-to-machine communication architecture, or attached as a separate element to such an element, function or application capable of conducting a communication, or the like, are capable to communicate via one or more channels for transmitting several types of data in a plurality of access domains, such as a PS domain and a CS domain. Furthermore, core network elements such as gateway network elements, mobility management entities, a mobile switching center, servers, and the like may be included.

The general functions and interconnections of the described elements, which also depend on the actual network type, are known to those skilled in the art and described in corresponding specifications, so that a detailed description thereof is omitted herein. However, it is to be noted that several additional network elements and signaling links may be employed for a communication to or from an element, function or application, like a communication endpoint, a communication network control element, such as an server, a radio network controller, and other elements of the same or other communication networks besides those described in detail herein below.

A communication network as being considered in examples of embodiments may also be able to communicate with other networks, such as a public switched telephone network or the Internet. The communication network may also be able to support the usage of cloud services for virtual network elements or functions thereof, wherein it is to be noted that the virtual network part of the telecommunication network can also be provided by non-cloud resources, e.g. an internal network or the like. It should be appreciated that network elements of an access system, of a core network etc., and/or respective functionalities may be implemented by using any node, host, server, access node or entity etc. being suitable for such a usage.

Furthermore, a network element, such as communication elements, like a UE, access network elements, like a base station, an eNB, a radio network controller, other network

elements, like a core network element, a server, etc., as well as corresponding functions as described herein, and other elements, functions or applications may be implemented by software, e.g. by a computer program product for a computer, and/or by hardware. For executing their respective functions, correspondingly used devices, nodes, functions

5 or network elements may include several means, modules, units, components, etc. (not shown) which are required for control, processing and/or communication/signaling functionality. Such means, modules, units and components may include, for example, one or more processors or processor units including one or more processing portions for executing instructions and/or programs and/or for processing data, storage or memory

10 units or means for storing instructions, programs and/or data, for serving as a work area of the processor or processing portion and the like (e.g. ROM, RAM, EEPROM, and the like), input or interface means for inputting data and instructions by software (e.g. floppy disc, CD-ROM, EEPROM, and the like), a user interface for providing monitor and manipulation possibilities to a user (e.g. a screen, a keyboard and the like), other

15 interface or means for establishing links and/or connections under the control of the processor unit or portion (e.g. wired and wireless interface means, radio interface means including e.g. an antenna unit or the like, means for forming a radio communication part etc.) and the like, wherein respective means forming an interface, such as a radio communication part, can be also located on a remote site (e.g. a radio head or a radio

20 station etc.). It is to be noted that in the present specification processing portions should not be only considered to represent physical portions of one or more processors, but may also be considered as a logical division of the referred processing tasks performed by one or more processors.

25 It should be appreciated that according to some examples, a so-called "liquid" or flexible network concept may be employed where the operations and functionalities of a network element, a network function, or of another entity of the network, may be performed in different entities or functions, such as in a node, host or server, in a flexible manner. In other words, a "division of labor" between involved network elements, functions or

30 entities may vary case by case.

With regard to Fig. 1, a diagram illustrating a configuration of communication network environment where some examples of embodiments are implementable. It is to be noted that the structure indicated in Fig. 1 shows only those parts which are useful for

35 understanding principles underlying some examples of embodiments of the invention.

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As also known by those skilled in the art there may be several other network elements or devices involved e.g. in a communication which are omitted here for the sake of simplicity. Furthermore, it is to be noted that links indicated in Fig. 1 are intended to show only principle examples of connections between respective network parts. It is possible that also additional or alternative links than those indicated in Fig. 1 are provided in a corresponding network, and/or that respective network elements or functions communicate with other network elements or functions by using intermediate nodes shown or not shown in Fig. 1. It is to be noted that examples of embodiments are not limited to the number of communication stations, elements, functions, and links as indicated in Fig. 1, i.e. there may be implemented or present less of or more of the corresponding stations, elements, functions, and links than those shown in Fig. 1.

Reference sign 10 denotes a UE representing an example of a communication element configured to communicate via IP connectivity. It is assumed that the UE 10 is capable of transmitting and receiving simultaneously in multiple access networks types/domains or is capable of transmitting and receiving in only one access network domain at a time. The UE 10 is movable within the network area, which is indicated by an arrow in Fig. 1.

Reference sign 20 denotes an access point to a first access network subsystem. According to the example shown in Fig. 1, an eNB represents an access point to an LTE network part, which represents an example for a PS access domain (first access domain).

Reference signs 30 and 40 denote gateway elements in the LTE network part, wherein SGW 30 is responsible for packet routing and PGW 40 is used for connecting the SGW 30 to external networks.

Reference sign 50 denotes a control network element of the first access domain, which is e.g. an MME.

Reference sign 60 denotes a database for subscriber information related to the communication element (UE 10) and includes e.g. a HSS containing user subscription and location information.

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Reference sign 70 denotes an access point to a second access network subsystem. According to the example shown in Fig. 1, an NB and an RNC represent an access to an UMTS network part, which represents an example for a CS access domain (second access domain).

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Reference sign 80 denotes a control network element of the second access domain, which is e.g. an MSC/MGCF and MGW being responsible for call control. In the example shown in Fig. 1, the MSC/MGCF&MGW 80 is enhanced for call continuity support.

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Next, parts of an IP multimedia network, such as an IMS, are described which are involved in the call registration and call continuity processing according to examples of embodiments. Examples of elements or functions of an IMS being involved in the processing according to some examples of embodiments include, for example, so-called call session control functions, also referred to as CSCF. The CSCF provides different functions, such as session management, service control, SIP proxy, and registrar functionalities in the IMS network. For example, an interrogating-CSCF (I-CSCF) which is the external contact point that hides the internal configuration of the IMS network part, and a serving-CSCF (S-CSCF) which supports the signaling interactions with the UE for registration, call setup, and supplementary service control are provided. In Fig. 1, the I-CSCF and the S-CSCF are depicted by one block 110. Furthermore, a proxy-CSCF (P-CSCF) 115 is provided which contains limited address translation functions to forward SIP requests initiated by or destined to a UE.

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The IMS according to the example shown in Fig. 1 comprises also a service continuity enabling element denoted by reference sign 120 and including e.g. an SCC AS. The SCC AS 120 provides IMS based mechanisms for enabling service continuity for sessions conducted via the IMS and is involved in access or domain transfer processing.

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For providing extended call continuity procedures such as eSRVCC, the IMS includes further elements or functions. Specifically, these are an access transfer control function (ATCF) denoted by reference sign 90 and an access transfer gateway (ATGW) 100. In the example shown in Fig. 1, the ATCF 90 is implemented as a part of the P-CSCF 115, but also other configurations are possible. The ATCF 90 and the ATGW 100 are used for anchoring control signaling and bearers in the serving network part, wherein the ATGW 100 is used to partition a media path of an PS (IMS) call between UE 10 and a

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remote point (e.g. another UE) in a remote (e.g. terminating) network 130 (representing e.g. an external packet data network) into two access legs for each UE. It is to be noted that call continuity procedures may be implemented for one or both sides of a call, i.e. for the call originating UE and the call terminating UE, for example. In other words, the UE 10 may be either the call originating UE or the call terminating UE in the session. In the following, for the sake of simplicity, it is assumed that the UE 10 is the call originating UE and that a call terminating point is located in the remote network 130.

Fig. 1 shows also links or connections (such as interfaces etc.) between the respective network elements or functions. For example, links involved in control signaling also with regard to call continuity processing and registration processing according to some example of embodiments are depicted by means of dashed lines, while links involved in the media path are indicated by solid lines. Details of these links, interfaces and connections may be implementation specific and generally known to those skilled in the art, so that a detailed description of each interface or link between the elements and functions according to an example as shown in Fig. 1 is omitted. However, it is to be noted that according to some examples of embodiments, links between elements or functions like the HSS 60 and the I-CSCF 110 (which is referred to, for example, as Sh interface) and the HSS 60 and the SCC AS 120 (which is referred to, for example, as Cx interface) are used for signaling related to examples of embodiments. Furthermore, it is to be noted that the media paths (solid line) indicated in Fig. 1 represent examples of media paths established in case of using the extended call continuity procedure such as eSRVCC. When a normal call continuity procedure (such as SRVCC) is used (where the ATGW and ATCF are not involved), a media path via CS domain may be established, for example, from the MSC/MGCF&MGW 80 to and from the remote network 130.

Next, an example for an execution of a call continuity procedure for access or domain transfer in an example based on the configuration shown in Fig. 1 is described.

First, it is assumed that the UE 10 accesses the LTE network through eNB 20 and makes an IMS call (e.g. VoLTE call). The access of the UE 10 is therefore routed through the eNB 20, the SGW 30, the PGW 40 and the ATGW 100 from where it is routed to the terminating network 130 (ATGW 100 is anchor point). However, as indicated above, examples of embodiments are not limited to such a case; instead of a call direction where the UE 10 is the call originating side, the call direction may be also vice versa, i.e. the

UE 10 is on the call terminating side. Also in this case the call continuity procedures according to examples of embodiments apply.

When UE 10 is switched from LTE to UMTS during an IMS call, e.g. due to movement
5 out of coverage of the LTE access which makes a handover necessary, the media path of the IMS call has to be adapted, i.e. access transfer has to be conducted. Thus, the call continuity procedure (eSRVCC procedure) for conducting the access transfer is started, in which the MSC 80 and the MME 60 communicate with each other to allocate radio and gateway resources when performing the access transfer procedure. As a
10 result, the access leg of UE 10 is switched to a route including the NB/RNC 70, the MSC/MGCF 80 and the ATGW 100 from where it is routed to the terminating network 130 (ATGW 100 is still anchor point). That is, the access transfer does not affect the access leg of the terminating point as its leg remains at ATGW 100.

15 It is to be noted that also other call continuity procedures are applicable, such as a procedure not using the enhancement provided by ATCF and ATGW as anchor points in the SN. For example, in a "normal" SRVCC procedure, the SCC AS is used as an anchor point for SIP signaling path while the media anchor is the remote side, such as a terminating UE or a UA, like an MGCF for a call to or from the CS domain. In other words,
20 in an SRVCC procedure, the route for the access leg is switched for e.g. a call terminating UE (i.e. on the remote side of the call) from PGW 40 to MSC 80, for example, since no intermediate anchoring point like the ATGW 100 is included. Route change is instructed in this case by the SCC AS.

25 As described above, in IMS calls, like VoLTE deployments, the eSRVCC procedure is used to transfer calls from VoLTE (IMS) to CS if the mobile phone uses LTE coverage and moves to UMTS coverage, for example. The ATCF 90 and the ATGW 100 anchor the signalling and media respectively at call set-up.

30 However, there may be situations where the ATCF becomes unreachable. This may happen, for example, due to a crashes of the ATCF during the call, e.g. the ATCF fails or the connection to the ATCF is broken.

In such a situation, a domain transfer of a particular call will not be possible, since in a
35 conventional eSRVCC procedure, for performing an access transfer, the MSC has to

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contact the ATCF. The respective message flow would go through the I-CSCF. The address of the responsible ATCF is received from the HSS 60 depending on corresponding identifiers such as STN-SR. Now, in a normal case, the ATCF is contacted by the I-CSCF and the eSRVCC procedure would start. However, in case the ATCF is not available or reachable anymore, the procedure would have to stop here, which would cause an unsuccessful access transfer and hence a call drop, which is undesirable for the user.

Thus, according to examples of embodiments, a mechanism is provided which allows to continue with a planned call continuity procedure and hence to complete an access or domain transfer of an IMS call and the like even if an initially started call continuity procedure, such as an eSRVCC procedure using an access transfer control function becoming unreachable during the ongoing call, can not be completed.

According to some examples of embodiments, there is provided a configuration allowing to continue with the domain transfer started by an extended call continuity procedure (e.g. eSRVCC with ATCF) by going back to (restoring) a non-extended call continuity procedure, such as a basic or normal SRVCC procedure which does not require the ATCF. In other words, it is proposed to execute another call continuity procedure, such as a normal SRVCC.

In order to such a fallback or restoration, it is necessary to consider specific measures in a registration processing (i.e. before call setup) and in an actual session transfer phase, compared to a conventional processing. For example, in case of using SRVCC and eSRVCC procedures, when the ATCF is not reachable, measures are provided to enable that the SCC AS can be contacted in a different way and requested to continue with normal SRVCC.

Specifically, according to some examples of embodiments, in case the ATCF 90 is not reachable, the SCC AS 120 will be contacted directly by the I-CSCF. For this purpose, the I-CSCF has to know about the information needed by the SCC AS and about the SCC AS itself. This information can be found in access transfer information, such as ATU-STI. Consequently, measures are provided to forward the ATU-STI to the I-CSCF at a suitable time.

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For example, according to some examples of embodiments, a new message flow is provided which allows to send, during registration of a UE, the ATU-STI to the HSS. That is, the SCC AS stores the ATU-STI, which it usually communicates to the ATCF, in the HSS. This storage is done together with the (already standardised) storage of STN-SR, such that the HSS can associate the ATU-STI with the STN-SR. Thus, the HSS can retrieve the ATU-STI associated with an STN-SR.

Furthermore, according to some examples of embodiments, at a domain transfer time (i.e. when the access transfer is to be conducted), in the event of conducting an eSRVCC procedure, the HSS provides, in addition to information related to an address of the ATCF, the I-CSCF with the ATU-STI. With this information, the I-CSCF can, in case the ATCF cannot be reached and hence the eSRVCC can not be completed, contact the SCC AS directly in order to trigger a normal SRVCC procedure. That is, when the I-CSCF receives a domain transfer request from the MSC-Server/MGCF, but cannot reach the ATCF, it continues the call transfer by routing the call directly to the SCC AS using the ATU-STI.

According to some examples of embodiments, the I-CSCF includes a specific indication to the signalling to the SCC AS indicating that it is required to restore the call continuity procedure. The SCC AS recognizes the indication and handles the domain transfer in analogy to a domain transfer without ATCF. For example, the SCC AS answers to the MGCF and performs a remote leg update (i.e. call control leg towards the remote (terminating) party), and cancels the leg to the ATCF.

In connection with Figures 2 to 4, examples of embodiments for implementing the above described measures are described wherein elements being used in these examples correspond to the elements shown in Fig. 1. It is to be noted that the signaling flows indicated in Figs. 2 to 4 may be forwarded between a starting point and an end point via one or more additional nodes or function, which are not illustrated for the sake of simplicity. Furthermore, where suitable, the elements and functions belonging to the SN and the parts belonging to the HN are indicated by means of a corresponding partition in respective parts (illustrated by a dashed line).

Fig. 2 shows a signaling diagram illustrating a registration processing according to some examples of embodiments. Specifically, Fig. 2 is related to an IMS registration processing using an ATCF enhancement (e.g. eSRVCC compatible).

According to some examples of embodiments, when it is assumed that the extended call continuity procedure is a procedure with access transfer control function enhancement, such as e.g. an eSRVCC procedure, it is required that a routable STN-SR pointing to the ATCF 90 is provided to the MME 50 before an SRVCC procedure is triggered, in order to ensure that the MSC (MSC Server) 80 selects the correct ATCF during the SRVCC procedure.

According to the present example, in S10, the UE 10 sends an initial registration request to the home network via the ATCF 90 (it is to be noted that CSCF parts, such as P-CSCF and I-CSCF, are not shown in diagram).

In S20, the ATCF 90 decides, based e.g. on operator policy and if the home network supports SRVCC enhanced with ATCF, to allocate an STN-SR. Furthermore, the ATCF 90 includes itself in the signalling path for subsequent messages during the registration period. For example, service level agreements are used to understand whether the home network supports SRVCC enhanced with ATCF.

The STN-SR is included in a request for registration forwarded to the I/S-CSCF 110 (specifically the S-CSCF part) in S30. Upon reception of the request, the S-CSCF sends the registration request to the SCC AS 120 in S40.

The SCC AS 120 sends a Sh-Pull message to the HSS 60 in order to know whether the UE 10 is SRVCC capable, and to retrieve the STN-SR stored in the HSS.

The HSS 60 replies in S60 to the SCC AS 120 with a Sh-Pull Response message including the UE SRVCC capability and the STN-SR (if available).

Then, in connection S70, the SCC AS 120 determines, e.g. based on the outcome of Sh-pull procedure, that the user is subscribed for SRVCC via the presence of STN-SR and that the UE 10 is SRVCC capable. Moreover, the SCC AS 120 determines access transfer information including the ATU-STI. Then, in S70, the SCC AS 120 sends a Sh-Update message to the HSS in order to provide the STN-SR (i.e. that received from the ATCF 90) to the HSS 60 so that the STN-SR pointing to the ATCF is stored in the HSS 60. In addition, the SCC AS 120 sends the ATU-STI pointing to the SCC AS 120 to the

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HSS 60 so that this ATU-STI is also stored in the HSS 60. Both information parts are stored in such a manner that they are associated to each other, so that it can retrieve the ATU-STI associated to the STN-SR.

5 In S80, the HSS 60 responds by sending Sh-update response message to the SCC AS 120.

10 In S90, the HSS 60 having updated the stored STN SR provides the updated STN-SR to the MME 50 by means of an insert subscription data message including the STN-SR. The MME 50 stores the updated STN-SR and responds to the HSS 60 in S100 with an insert subscription data answer message. Then, in S110, the SCC AS 120 returns a 200 OK to the S-CSCF 110.

15 Fig. 3 shows a signaling diagram illustrating an information provision processing according to some examples of embodiments. Specifically, Fig. 3 shows an example how the ATU-STI is communicated from the SCC AS 120 to the ATCF 90. Access transfer information including the ATU-STI and the C-MSISDN, are required for executing the access or domain transfer procedure.

20 According to some examples of embodiments, the SCC AS 120 initiates the access transfer information exchange after the registration processing shown in Fig. 2 is completed, i.e. when the ATCF 90 is included in the path and the UE 10 is SRVCC capable.

25 That is, after executing the registration for UE 10 as described in connection with Fig. 2, and prior to any access transfer execution, the SCC AS 120 sends in S210 the access transfer information towards the ATCF 90, specifically by sending a message including the ATU-STI and C-MSISDN to the S-CSCF (S210), which forwards the message to the I-CSCF in S220, which in turn forwards the message to the ATCF 90.

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Fig. 4 shows a signaling diagram illustrating a session transfer processing according to some examples of embodiments. Specifically, Fig. 4 shows a session transfer processing where, as a call continuity procedure conducted for session or domain change of the communication (e.g. VoLTE) of the UE 10, an eSRVCC procedure is initially started and changed to a "normal" SRVCC procedure at a specific timing.

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In the example shown in Fig. 4, as one option allowed for routing the session transfer request for eSRVCC, an approach is implemented where the STN-SR is configured as a PSI in the HSS 60, wherein the PSI is statically assigned to the SCC-AS 120 in the HSS 60.

Once the need for session or domain transfer has been noticed, e.g. due to a movement of the UE 10 requiring a handover from LTE network part to UMTS network part as indicated in connection with Fig. 1 (i.e. a domain transfer for call continuity has to be executed), the MME 50 triggers in S300 the eSRVCC procedure e.g. for the voice bearer at the MSC/MGCF 80. Consequently, in S310, the MSC/MGCF 80 sends a session transfer invite message towards a target to which the STN-SR received from the MME 50 points, i.e. ATCF 90. As the number range of the STN-SR belongs to the IMS network, the message is initially routed to an entry point to the IMS, i.e. I/S-CSCF 110 (specifically the I-CSCF part).

In S320, the I-CSCF sends an LIR to the HSS in order to request the HSS 60 to provide the address of the ATCF associated with the STN-SR (i.e. ATCF 90).

According to some examples of embodiments, the I-CSCF indicates to the HSS 60 that it supports a procedure for switching or changing the call continuity procedure, e.g. from the eSRVCC to the "normal" SRVCC, wherein this support indication is to be seen as a request to the HSS 60 to send also the ATU-STI. In S330, the HSS 60 answers to the LIR by a LIA including the ATCF address information and the ATU-STI.

It is to be noted that according to other examples of embodiments also a variant to the above described process is possible. In this alternative, the ATU-STI is not requested in S320 (e.g. by omitting the support indication), so that it is also not sent in the initial LIA for the LIR requesting the STN-SR. Instead, the I-CSCF request the ATU-STI by sending a dedicated message to the HSS (not shown in Fig. 4, but in practice another LIA) only in case it is needed (which is the case if the ATCF is not reachable in a further signalling flow). The dedicated message contains e.g. a specific indication so as to inform the HSS 60 that ATU-STI must be sent in reply.

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That is, the HSS 60 responds to the I-CSCF and returns the ATCF address and the ATU-STI associated with the STN-SR, which were stored in the registration processing described above.

5 In S340, it is assumed that the I-CSCF tries to reach the ATCF 90 in order to execute the eSRVCC procedure. For example, the I-CSCF forwards a session transfer invite to the ATCF (with or without adding a route header). It is to be noted that the I-CSCF stores the ATU-STI at least as long as it does not receive a response from the ATCF 90..

10 Now, it is assumed that, according to examples of embodiments, the ATCF 90 is unreachable. That is, the I-CSCF does not receive a response, and after expiry of a certain timer or the like, the I-CSCF decides in S350 that the ATCF 90 can not be reached. Hence, it conducts a processing for changing the call continuity procedure. Specifically, according to some examples of embodiments, the I-CSCF redirects the
15 session transfer invite message to the SCC AS 120 by using the ATU-STI received in S330 and kept stored.

In S360, the I-CSCF sends the session transfer invite to the SCC AS 120. In order to inform the SCC AS 120 to apply a specific handling for supporting the domain transfer without ATCF, the I-CSCF includes an indication (restoration indication) from which the
20 SCC AS 120 can learn that the call continuity processing is changed, for example, from the eSRVCC to the "normal" SRVCC.

25 In S370, the SCC AS 120 recognises the restoration indication and therefore performs the domain transfer like for SRVCC, i.e. by sending a remote-leg update and (potentially) cancelling the access source leg.

Fig. 5 shows a flow chart of a processing conducted in a system implemented in a
30 communication network and related to a call continuity processing according to some examples of embodiments. Specifically, the example according to Fig. 5 is related to a procedure conducted by network elements or functions involved in a registration processing and a session or domain transfer processing, such as that shown in connection with Figs. 2 and 4.

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In S400, a registration procedure for a communication element (e.g. UE 10) is conducted for acquiring PS (e.g. IP) connectivity (e.g. for VoLTE) in a communication network via an IP multimedia network. As described above, it is assumed, according to some examples of embodiments, that the communication network is configured to execute an extended call continuity procedure (such as eSRVCC) and a non-extended call continuity procedure (such as SRVCC) for transferring access of at least one media path of the communication element from a first access domain (e.g. PS domain) to a second access domain (e.g. CS domain)

In the registration processing, an extended call continuity procedure is enabled, e.g. by including corresponding function like an access transfer control function (e.g. ATCF 90) in a session path used for the communication element. Furthermore, an identifier for the access transfer control function (e.g. STN-SR) used for directing a signaling to the access transfer control function is transmitted to a call session control function (e.g. I/S-CSCF 110, in particular S-CSCF) of the IP multimedia network. This call session control function initiates a registration of the communication element at a service continuity enabling element (e.g. SCC-AS 120) of the IP multimedia network. Here, an access transfer information element (e.g. ATU-STI) used for directing signaling to the service continuity enabling element is determined, wherein then the access transfer information element and the identifier for the access transfer control function are stored in association with each other in a database for subscriber information related to the communication element (e.g. HSS 60).

In S410, when an execution of the extended call continuity procedure is triggered (e.g. due to handover of UE 10 to CS access domain, e.g. via NB/RNC 70) for conducting an access transfer from the first access domain to the second access domain is triggered, address information of the access transfer control function is requested on the basis of the identifier for the access transfer control function by sending a corresponding request to the database for subscriber information. The call session control function of the IP multimedia network is provided with the address information of the access transfer control function in response. Furthermore, according to examples of embodiments of the invention, the call session control function requests from the database for subscriber information also the access transfer information element used for directing signaling to the service continuity enabling element and associated with the identifier for the access transfer control function.

According to some examples of embodiments, the access transfer information element used for directing signaling to the service continuity enabling element and associated with the identifier for the access transfer control function is requested by sending, with the request for the address information of the access transfer control function, an indication for an ability to change the extended call continuity procedure to a non-extended call continuity procedure (also referred to as support indication). Then, the access transfer information element used for directing signaling to the service continuity enabling element is transmitted to the call session control function of the IP multimedia network together with the identifier for the access transfer control function.

Alternatively, according to some examples of embodiments, the access transfer information element used for directing signaling to the service continuity enabling element and associated with the identifier for the access transfer control function is requested by sending a dedicated message for requesting transmission of the access transfer information element used for directing signaling to the service continuity enabling element. This message is sent, for example, when it is determined that the access transfer control function is not reachable during the processing for executing the extended call continuity procedure. In this case, the access transfer information element used for directing signaling to the service continuity enabling element is transmitted to the call session control function of the IP multimedia network in response to the dedicated message.

As indicated above, when the extended call continuity procedure is executed, in which context the request for a session or domain transfer is sent, a corresponding session transfer request is sent from the call session control function of the IP multimedia network to the access transfer control function. In this context, it is determined, in S420, whether the access transfer control function is reachable or not. For example, this determination is based on a timer expiry, wherein in case the access transfer control function reacts in a predetermined time, it is determined to be reachable, and vice versa.

In case it is determined in S420 (YES) that the access transfer control function is reachable, the process proceeds to S430 where the (originally intended) extended call continuity procedure (e.g. eSRVCC) is executed by the network.

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Otherwise, in case it is determined in S420 (NO) that the access transfer control function is not reachable, S440 follows where a change of the processing from an execution of the extended call continuity procedure to an execution of a non-extended call continuity procedure is made. In this context, the session transfer request is sent from the call session control function of the IP multimedia network to the service continuity enabling element wherein the previously received access transfer information element is used. In addition, according to some examples of embodiments, the signaling to the service continuity enabling element includes an indication for the change to the non-extended call continuity procedure to the service continuity enabling element (also referred to restoration indication).

In S450, the service continuity enabling element receives and processes the session transfer request from the call session control function of the IP multimedia network, wherein it may be recognized that it concerns a session in which the access transfer control function is involved. On the basis of the indication for the change to the non-extended call continuity procedure provided to the service continuity enabling element, it is determined that a non-extended call continuity procedure is to be executed, i.e. that a change in the call continuity procedure was effected. Then, for executing the non-extended call continuity procedure, a processing is conducted for transferring the access domain from the first access domain to the second access domain without the access transfer control function. For example, according to some examples of embodiments, the processing for transferring the access domain from the first access domain to the second access domain according to the non-extended call continuity procedure includes to conduct a remote leg update for changing connection to a control network element of the second access domain (e.g. MSC/MGCF 80), and to cancel an access source leg to the access transfer control function.

Fig. 6 shows a flow chart of a processing conducted in a call session control function according to some examples of embodiments. Specifically, the example according to Fig. 6 is related to a procedure conducted by a call session control function of an IP multimedia network involved in a registration processing and a session or domain transfer processing, such as that shown in connection with Figs. 2 and 4.

In S500, an identifier for an access transfer control function (e.g. STN-SR) is obtained at the call session control function (e.g. I/S-CSCF 110). For example, the identifier for the

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access transfer control function is received when a registration procedure for a communication element (e.g. UE 10) for acquiring PS (IP) connectivity in the communication network via an IP multimedia network is conducted (including the ability to execute an extended call continuity procedure and a non-extended call continuity procedure for transferring access of at least one media path of the communication element from a first access domain (e.g. PS domain) to a second access domain (e.g. CS domain), wherein the identifier for the access transfer control function is used for directing a signaling to the access transfer control function (e.g. ATCF 90).

It is to be noted that the processing comprises also an initiation of a corresponding registration of the communication element at a service continuity enabling element of the IP multimedia network (e.g. SCC-AS 120).

In S510, when an execution of the extended call continuity procedure is triggered (e.g. due to handover of UE 10 to CS access domain, e.g. via NB/RNC 70) for conducting an access transfer from the first access domain to the second access domain is triggered, address information of the access transfer control function is requested on the basis of the identifier for the access transfer control function by sending a corresponding request to the database for subscriber information. The call session control function of the IP multimedia network is provided with the address information of the access transfer control function in response. Furthermore, according to examples of embodiments of the invention, the call session control function requests from the database for subscriber information also the access transfer information element used for directing signaling to the service continuity enabling element and associated with the identifier for the access transfer control function.

According to some examples of embodiments, the access transfer information element used for directing signaling to the service continuity enabling element and associated with the identifier for the access transfer control function is requested by sending, with the request for the address information of the access transfer control function, an indication for an ability to change the extended call continuity procedure to a non-extended call continuity procedure (also referred to as support indication). Then, the access transfer information element used for directing signaling to the service continuity enabling element is received by the call session control function of the IP multimedia network together with the identifier for the access transfer control function.

Alternatively, according to some examples of embodiments, the access transfer information element used for directing signaling to the service continuity enabling element and associated with the identifier for the access transfer control function is requested by sending a dedicated message for requesting transmission of the access transfer information element used for directing signaling to the service continuity enabling element. This message is sent, for example, when it is determined that the access transfer control function is not reachable during the processing for executing the extended call continuity procedure. In this case, the access transfer information element used for directing signaling to the service continuity enabling element is received by the call session control function of the IP multimedia network in response to the dedicated message.

In S520, the extended call continuity procedure is executed, in which context a corresponding session transfer request is sent from the call session control function of the IP multimedia network to the access transfer control function. Here, it is determined, in S530, whether the access transfer control function is reachable or not. For example, this determination is based on a timer expiry, wherein in case the access transfer control function reacts in a predetermined time, it is determined to be reachable, and vice versa.

In case it is determined in S530 (YES) that the access transfer control function is reachable, the process proceeds to S540 where the (originally intended) extended call continuity procedure (e.g. eSRVCC) is continued.

Otherwise, in case it is determined in S530 (NO) that the access transfer control function is not reachable, S550 follows where a change of the processing from an execution of the extended call continuity procedure to an execution of a non-extended call continuity procedure is made. In this context, the session transfer request is sent from the call session control function of the IP multimedia network to the service continuity enabling element wherein the previously received access transfer information element is used. In addition, according to some examples of embodiments, the signaling to the service continuity enabling element includes an indication for the change to the non-extended call continuity procedure to the service continuity enabling element (also referred to as restoration indication).

In S560, the non-extended call continuity procedure is executed.

5 Fig. 7 shows a flow chart of a processing conducted in a service continuity enabling element according to some examples of embodiments. Specifically, the example according to Fig. 7 is related to a procedure conducted by a service continuity enabling element of an IP multimedia network involved in a registration processing and a session or domain transfer processing, such as that shown in connection with Figs. 2 and 4.

10 In S600, when a registration procedure for a communication element (e.g. UE 10) for acquiring PS (IP) connectivity in a communication network via an IP multimedia network is conducted (wherein an extended call continuity procedure (e.g. eSRVCC) and a non-extended call continuity procedure (e.g. SRVCC) for transferring access of at least one media path of the communication element from a first access domain (e.g. PS domain) to a second access domain (e.g. CS domain) are enabled), an access transfer information element used for directing signaling to a service continuity enabling element (e.g. ATU-STI) is determined. Storing of the access transfer information element, in association with an identifier for an access transfer control function (e.g. STN-SR), in a database for subscriber information related to the communication element (e.g. HSS 60) is caused.

20

In S610, a session transfer request regarding a session in which an access transfer control function (e.g. ATCF 90) is involved is received from a call session control function of the IP multimedia network (e.g. I/S-CSCF 110), and processed.

25

In this context, it is determined in S620, e.g. on the basis of an indication for a change to the non-extended call continuity procedure (also referred to as restoration indication), that a non-extended call continuity procedure is to be executed.

30

In S630, for executing the non-extended call continuity procedure, a processing is conducted for transferring the access domain from the first access domain to the second access domain without the access transfer control function. For example, according to some examples of embodiments, the processing for transferring the access domain from the first access domain to the second access domain according to the non-extended call continuity procedure includes to conduct a remote leg update for changing connection to

a control network element of the second access domain (e.g. MSC/MGCF 80), and to cancel an access source leg to the access transfer control function.

Fig. 8 shows a diagram of a network element or function like a call session control function (e.g. I/S-CSCF 110) according to some examples of embodiments, which is configured to implement a procedure for call continuity processing as described in connection with some of the examples of embodiments. It is to be noted that the network element or function, like the I/S-CSCF 110 of Fig. 1, may include further elements or functions besides those described herein below. Furthermore, even though reference is made to a network element or function, the element or function may be also another device or function having a similar task, such as a chipset, a chip, a module, an application etc., which can also be part of a network element or attached as a separate element to a network element, or the like. It should be understood that each block and any combination thereof may be implemented by various means or their combinations, such as hardware, software, firmware, one or more processors and/or circuitry.

The I/S-CSCF 110 shown in Fig. 8 may include a processing circuitry, a processing function, a control unit or a processor 1101, such as a CPU or the like, which is suitable for executing instructions given by programs or the like related to the control procedure. The processor 1101 may include one or more processing portions or functions dedicated to specific processing as described below, or the processing may be run in a single processor or processing function. Portions for executing such specific processing may be also provided as discrete elements or within one or more further processors, processing functions or processing portions, such as in one physical processor like a CPU or in one or more physical or virtual entities, for example. Reference sign 1102 denotes input/output (I/O) units or functions (interfaces) connected to the processor or processing function 1101. The I/O units 1102 may be used for communicating with the communication network and/or other entities or functions, as described in connection with Fig. 1, for example. The I/O units 1102 may be a combined unit including communication equipment towards several entities, or may include a distributed structure with a plurality of different interfaces for different entities. Reference sign 1104 denotes a memory usable, for example, for storing data and programs to be executed by the processor or processing function 1101 and/or as a working storage of the processor or processing function 1101. It is to be noted that the memory 1104 may be

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implemented by using one or more memory portions of the same or different type of memory.

5 The processor or processing function 1101 is configured to execute processing related to the above described procedure for call continuity processing. In particular, the processor or processing circuitry or function 1101 includes one or more of the following sub-portions. Sub-portion 1105 is a processing portion which is usable as a portion for requesting and receiving the access transfer control function address and the access transfer information (ATU-STI). The portion 1105 may be configured to perform
10 processing according to S510 of Fig. 6. Furthermore, the processor or processing circuitry or function 1101 may include a sub-portion 1106 usable as a portion for executing the extended call continuity procedure, wherein a timer function may be included. The portion 1106 may be configured to perform a processing according to S520, S530 and S540 of Fig. 6. In addition, the processor or processing circuitry or
15 function 1101 may include a sub-portion 1107 usable as a portion for switching the call continuity procedure and for executing the non-extended call continuity procedure. The portion 1107 may be configured to perform a processing according to S550 and S560 of Fig. 6.

20 Fig. 9 shows a diagram of a network element or function like a service continuity enabling element (e.g. SCC-AS 120) according to some examples of embodiments, which is configured to implement a procedure for call continuity processing as described in connection with some of the examples of embodiments. It is to be noted that the network element or function, like the SCC-AS 120 of Fig. 1, may include further elements or
25 functions besides those described herein below. Furthermore, even though reference is made to a network element or function, the element or function may be also another device or function having a similar task, such as a chipset, a chip, a module, an application etc., which can also be part of a network element or attached as a separate element to a network element, or the like. It should be understood that each block and
30 any combination thereof may be implemented by various means or their combinations, such as hardware, software, firmware, one or more processors and/or circuitry.

The SCC-AS 120 shown in Fig. 8 may include a processing circuitry, a processing function, a control unit or a processor 1201, such as a CPU or the like, which is suitable
35 for executing instructions given by programs or the like related to the control procedure.

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The processor 1201 may include one or more processing portions or functions dedicated to specific processing as described below, or the processing may be run in a single processor or processing function. Portions for executing such specific processing may be also provided as discrete elements or within one or more further processors, processing functions or processing portions, such as in one physical processor like a CPU or in one or more physical or virtual entities, for example. Reference sign 1202 denotes input/output (I/O) units or functions (interfaces) connected to the processor or processing function 1201. The I/O units 1202 may be used for communicating with the communication network and/or other entities or functions, as described in connection with Fig. 1, for example. The I/O units 1202 may be a combined unit including communication equipment towards several entities, or may include a distributed structure with a plurality of different interfaces for different entities. Reference sign 1204 denotes a memory usable, for example, for storing data and programs to be executed by the processor or processing function 1201 and/or as a working storage of the processor or processing function 1201. It is to be noted that the memory 1204 may be implemented by using one or more memory portions of the same or different type of memory.

The processor or processing function 1201 is configured to execute processing related to the above described procedure for call continuity processing. In particular, the processor or processing circuitry or function 1201 includes one or more of the following sub-portions. Sub-portion 1205 is a processing portion which is usable as a portion for conducting a processing for storing an identifier for an access transfer control function (e.g. STN-SR) and access transfer information (e.g. ATU-STI). The portion 1205 may be configured to perform processing according to S600 of Fig. 7. Furthermore, the processor or processing circuitry or function 1201 may include a sub-portion 1206 usable as a portion for receiving and processing a session or domain transfer request. The portion 1206 may be configured to perform a processing according to S610 and S620 of Fig. 7. In addition, the processor or processing circuitry or function 1201 may include a sub-portion 1207 usable as a portion for switching the call continuity procedure and for executing the non-extended call continuity procedure. The portion 1207 may be configured to perform a processing according to S630 of Fig. 7.

As described above, according to examples of embodiments, procedures are provided allowing to continue with a planned call continuity procedure and hence to complete an

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access or domain transfer of an IMS call and the like even if an initially started call continuity procedure, such as an eSRVCC procedure using an access transfer control function becoming unreachable during the ongoing call, can not be completed.

5 By means of the proposed procedures described above, it is possible to complete a call continuity procedure for changing an access domain of a UE from a first domain, such as a PS domain, to a second domain, such as a legacy voice domain like a CS domain, even in case of a failure situation, for example, when a control function necessary for the originally intended call continuity procedure becomes unreachable. Thus, user
10 experience can be improved.

In addition, according to another example of embodiments, there is provided an apparatus comprising at least one processing circuitry, and at least one memory for storing instructions to be executed by the processing circuitry, wherein the at least one
15 memory and the instructions are configured to, with the at least one processing circuitry, cause the apparatus at least: to receive, when conducting a registration procedure for a communication element for acquiring packet switched connectivity in a communication network via an IP multimedia network, wherein the communication network is configured to execute an extended call continuity procedure and a non-extended call continuity
20 procedure for transferring access of at least one media path of the communication element from a first access domain to a second access domain, an identifier for an access transfer control function used for directing a signaling to the access transfer control function; to initiate a registration of the communication element at a service continuity enabling element of the IP multimedia network; to request, on the basis of the identifier for the access transfer control function, address information of the access
25 transfer control function from a database for subscriber information, and to request, from the database for subscriber information, an access transfer information element used for directing signaling to a service continuity enabling element and associated with the identifier for the access transfer control function; and to receive the address information
30 of the access transfer control function and the access transfer information element used for directing signaling to the service continuity enabling element and associated with the identifier for the access transfer control function.

According to a further example of embodiments, in the above described example, the at
35 least one memory and the instructions are further configured to, with the at least one

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processing circuitry, cause the apparatus at least: for requesting of the access transfer information element, to execute one of sending, with the request for the address information of the access transfer control function, an indication for an ability to change the extended call continuity procedure to a non-extended call continuity procedure, wherein the access transfer information element used for directing signaling to the service continuity enabling element is transmitted to the call session control function of the IP multimedia network together with the identifier for the access transfer control function, and sending a dedicated message for requesting transmission of the access transfer information element used for directing signaling to the service continuity enabling element when it is determined that the access transfer control function is not reachable, wherein the access transfer information element used for directing signaling to the service continuity enabling element is transmitted to the call session control function of the IP multimedia network in response to the dedicated message.

According to a further example of embodiments, in one of the above described examples, the at least one memory and the instructions are further configured to, with the at least one processing circuitry, cause the apparatus at least: to send, when executing the extended call continuity procedure, a session transfer request to the access transfer control function, to determine that the access transfer control function is not reachable, to change a processing from an execution of the extended call continuity procedure to an execution of a non-extended call continuity procedure, to send the session transfer request to the service continuity enabling element by using the access transfer information element, and to provide an indication for the change to the non-extended call continuity procedure to the service continuity enabling element.

In addition, according to another example of embodiments, there is provided an apparatus comprising at least one processing circuitry, and at least one memory for storing instructions to be executed by the processing circuitry, wherein the at least one memory and the instructions are configured to, with the at least one processing circuitry, cause the apparatus at least: to determine, when conducting a registration procedure for a communication element for acquiring packet switched connectivity in a communication network via an IP multimedia network, wherein the communication network is configured to execute an extended call continuity procedure and a non-extended call continuity procedure for transferring access of at least one media path of the communication element from a first access domain to a second access domain, an access transfer information element used for directing signaling to a service continuity enabling element;

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and to cause storing of the access transfer information element and an identifier for an access transfer control function in association with each other in a database for subscriber information related to the communication element.

5 According to a further example of embodiments, in the above described example, the at least one memory and the instructions are further configured to, with the at least one processing circuitry, cause the apparatus at least: to receive and process a session transfer request from a call session control function of the IP multimedia network regarding a session in which an access transfer control function is included, to determine,
10 on the basis of an indication for a change to the non-extended call continuity procedure, that a non-extended call continuity procedure is to be executed, and to conduct, for executing the non-extended call continuity procedure, a processing for transferring the access domain from the first access domain to the second access domain without the access transfer control function.

15 According to a further example of embodiments, in the above described example, the at least one memory and the instructions are further configured to, with the at least one processing circuitry, cause the apparatus at least: when conducting the processing for transferring the access domain from the first access domain to the second access domain according to the non-extended call continuity procedure, to conduct a remote leg
20 update for changing connection to a control network element of the second access domain, and to cancel an access source leg to the access transfer control function.

It should be appreciated that

25 - an access technology via which traffic is transferred to and from an entity in the communication network may be any suitable present or future technology, such as WLAN (Wireless Local Access Network), WiMAX (Worldwide Interoperability for Microwave Access), LTE, LTE-A, 5G, Bluetooth, Infrared, and the like may be used; additionally, embodiments may also apply wired technologies, e.g. IP based access
30 technologies like cable networks or fixed lines.

- embodiments suitable to be implemented as software code or portions of it and being run using a processor or processing function are software code independent and can be specified using any known or future developed programming language, such as a high-level programming language, such as objective-C, C, C++, C#, Java, Python, Javascript,
35 other scripting languages etc., or a low-level programming language, such as a machine language, or an assembler.

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- implementation of embodiments is hardware independent and may be implemented using any known or future developed hardware technology or any hybrids of these, such as a microprocessor or CPU (Central Processing Unit), MOS (Metal Oxide Semiconductor), CMOS (Complementary MOS), BiMOS (Bipolar MOS), BiCMOS (Bipolar CMOS), ECL (Emitter Coupled Logic), and/or TTL (Transistor-Transistor Logic).

- embodiments may be implemented as individual devices, apparatuses, units, means or functions, or in a distributed fashion, for example, one or more processors or processing functions may be used or shared in the processing, or one or more processing sections or processing portions may be used and shared in the processing, wherein one physical processor or more than one physical processor may be used for implementing one or more processing portions dedicated to specific processing as described,

- an apparatus may be implemented by a semiconductor chip, a chipset, or a (hardware) module including such chip or chipset;

- embodiments may also be implemented as any combination of hardware and software, such as ASIC (Application Specific IC (Integrated Circuit)) components, FPGA (Field-programmable Gate Arrays) or CPLD (Complex Programmable Logic Device) components or DSP (Digital Signal Processor) components.

- embodiments may also be implemented as computer program products, including a computer usable medium having a computer readable program code embodied therein, the computer readable program code adapted to execute a process as described in embodiments, wherein the computer usable medium may be a non-transitory medium.

Although the present invention has been described herein before with reference to particular embodiments thereof, the present invention is not limited thereto and various modifications can be made thereto.

CLAIMS

1. A method including

conducting a registration procedure for a communication element for acquiring packet switched connectivity in a communication network via an IP multimedia network, wherein the communication network is configured to execute an extended call continuity procedure and a non-extended call continuity procedure for transferring access of at least one media path of the communication element from a first access domain to a second access domain;

enabling the extended call continuity procedure by including an access transfer control function in a session path used for the communication element;

transmitting an identifier for the access transfer control function used for directing a signaling to the access transfer control function to a call session control function of the IP multimedia network;

initiating a registration of the communication element at a service continuity enabling element of the IP multimedia network;

determining an access transfer information element used for directing signaling to the service continuity enabling element; and

storing the access transfer information element and the identifier for the access transfer control function in association with each other in a database for subscriber information related to the communication element.

2. The method according to claim 1, further including

triggering an execution of the extended call continuity procedure for conducting an access transfer from the first access domain to the second access domain;

requesting, on the basis of the identifier for the access transfer control function, address information of the access transfer control function from the database for subscriber information;

transmitting, to the call session control function of the IP multimedia network, the address information of the access transfer control function;

requesting, from the database for subscriber information, the access transfer information element used for directing signaling to the service continuity enabling element and associated with the identifier for the access transfer control function; and

transmitting, to the call session control function of the IP multimedia network, the access transfer information element used for directing signaling to the service continuity enabling element and associated with the identifier for the access transfer control function.

3. The method according to claim 2, wherein the requesting of the access transfer information element used for directing signaling to the service continuity enabling element and associated

with the identifier for the access transfer control function is made at the requesting the database for subscriber information by one of

sending, with the request for the address information of the access transfer control function, an indication for an ability to change the extended call continuity procedure to a non-extended call continuity procedure, wherein the access transfer information element used for directing signaling to the service continuity enabling element is transmitted to the call session control function of the IP multimedia network together with the identifier for the access transfer control function, and

sending a dedicated message for requesting transmission of the access transfer information element used for directing signaling to the service continuity enabling element when it is determined that the access transfer control function is not reachable, wherein the access transfer information element used for directing signaling to the service continuity enabling element is transmitted to the call session control function of the IP multimedia network in response to the dedicated message.

4. The method according to any of claims 2 and 3, further including

sending, when executing the extended call continuity procedure, a session transfer request from the call session control function of the IP multimedia network to the access transfer control function,

wherein the method further includes, in case it is determined that the access transfer control function is not reachable,

changing a processing from an execution of the extended call continuity procedure to an execution of a non-extended call continuity procedure,

sending the session transfer request from the call session control function of the IP multimedia network to the service continuity enabling element by using the access transfer information element, and

providing an indication for the change to the non-extended call continuity procedure to the service continuity enabling element.

5. The method according to claim 4, further including

receiving and processing, at the service continuity enabling element, the session transfer request from the call session control function of the IP multimedia network regarding a session in which the access transfer control function is included;

determining, on the basis of the indication for the change to the non-extended call continuity procedure provided to the service continuity enabling element, that a non-extended call continuity procedure is to be executed; and

conducting, for executing the non-extended call continuity procedure, a processing for transferring the access domain from the first access domain to the second access domain without the access transfer control function.

6. The method according to claim 5, wherein

the processing for transferring the access domain from the first access domain to the second access domain according to the non-extended call continuity procedure further includes

conducting a remote leg update for changing connection to a control network element of the second access domain, and

cancelling an access source leg to the access transfer control function.

7. The method according to any of claims 1 to 6, wherein

the first access domain is a packet switched access domain of the communication network,

the second access domain is a circuit switched access domain of the communication network,

the extended call continuity procedure includes an evolved single radio voice call continuity procedure according to third generation partnership project specification,

the non-extended call continuity procedure includes a single radio voice call continuity procedure according to third generation partnership project specification,

the identifier for the access transfer control function used for directing a signaling to the access transfer control function includes a session transfer number – single radio element; and

the access transfer information element used for directing signaling to the service continuity enabling element includes a access transfer update – session transfer identifier element.

8. The method according to any of claims 1 to 7, wherein the method is implemented in at least one network element or function of the communication network, wherein

the communication element includes a user equipment configured to communicate via packet switched connectivity,

the access transfer control function includes an control function located in a serving network part,

the call session control function of the IP multimedia network includes one or more of an interrogating call session control function, a proxy call session control function and a serving call session control function;

the service continuity enabling element of the IP multimedia network includes a service centralization and continuity application server; and

the database for subscriber information related to the communication element includes a home subscriber server, wherein

a control network element of the first access domain includes a mobility management element, and

a control network element of the second access domain includes a mobile switching center.

9. A system including

a plurality of network elements or functions of a communication network, wherein the communication network is configured to execute an extended call continuity procedure and a non-extended call continuity procedure for transferring access of at least one media path of communication element, for which a registration procedure is conducted for acquiring packet switched connectivity in the communication network via an IP multimedia network, from a first access domain to a second access domain;

wherein the plurality of network elements or functions include

an access transfer control function included in a session path used for the communication element for enabling the extended call continuity procedure;

a call session control function of the IP multimedia network to which an identifier for the access transfer control function used for directing a signaling to the access transfer control function is transmitted;

a service continuity enabling element of the IP multimedia network configured to register the communication element, and to determine an access transfer information element used for directing signaling to the service continuity enabling element; and

a database for subscriber information related to the communication element, wherein the service continuity enabling element of the IP multimedia network is further configured to store the access transfer information element and the identifier for the access transfer control function in association with each other in the database for subscriber information.

10. The system according to claim 9, wherein

when an execution of the extended call continuity procedure for conducting an access transfer from the first access domain to the second access domain is triggered,

the call session control function of the IP multimedia network is configured to request, on the basis of the identifier for the access transfer control function, address information of the access transfer control function and the access transfer information element used for directing

signaling to the service continuity enabling element and associated with the identifier for the access transfer control function from the database for subscriber information, and

the database for subscriber information is configured to transmit to the call session control function of the IP multimedia network the address information of the access transfer control function and the access transfer information element used for directing signaling to the service continuity enabling element and associated with the identifier for the access transfer control function.

11. The system according to claim 10, wherein the call session control function of the IP multimedia network is further configured to request the access transfer information element used for directing signaling to the service continuity enabling element and associated with the identifier for the access transfer control function by one of

sending, with the request for the address information of the access transfer control function, an indication for an ability to change the extended call continuity procedure to a non-extended call continuity procedure, wherein the access transfer information element used for directing signaling to the service continuity enabling element is transmitted to the call session control function of the IP multimedia network together with the identifier for the access transfer control function, and

sending a dedicated message for requesting transmission of the access transfer information element used for directing signaling to the service continuity enabling element when it is determined that the access transfer control function is not reachable, wherein the access transfer information element used for directing signaling to the service continuity enabling element is transmitted to the call session control function of the IP multimedia network in response to the dedicated message.

12. The system according to any of claims 10 and 11, wherein the call session control function of the IP multimedia network is further configured

to send, when executing the extended call continuity procedure, a session transfer request to the access transfer control function,

to change, in case it is determined that the access transfer control function is not reachable, a processing from an execution of the extended call continuity procedure to an execution of a non-extended call continuity procedure,

to send the session transfer request to the service continuity enabling element by using the access transfer information element, and

to provide an indication for the change to the non-extended call continuity procedure to the service continuity enabling element.

13. The system according to claim 12, wherein the service continuity enabling element further is further configured

to receive and process the session transfer request from the call session control function of the IP multimedia network regarding a session in which the access transfer control function is included,

to determine, on the basis of the indication for the change to the non-extended call continuity procedure provided to the service continuity enabling element, that a non-extended call continuity procedure is to be executed; and

to conduct, for executing the non-extended call continuity procedure, a processing for transferring the access domain from the first access domain to the second access domain without the access transfer control function.

14. The system according to claim 13, wherein the service continuity enabling element further is further configured, for conducting the processing for transferring the access domain from the first access domain to the second access domain according to the non-extended call continuity procedure,

to conduct a remote leg update for changing connection to a control network element of the second access domain, and

to cancel an access source leg to the access transfer control function.

15. The system according to any of claims 9 to 14, wherein

the first access domain is a packet switched access domain of the communication network,

the second access domain is a circuit switched access domain of the communication network,

the extended call continuity procedure includes an evolved single radio voice call continuity procedure according to third generation partnership project specification,

the non-extended call continuity procedure includes a single radio voice call continuity procedure according to third generation partnership project specification,

the identifier for the access transfer control function used for directing a signaling to the access transfer control function includes a session transfer number – single radio element; and

the access transfer information element used for directing signaling to the service continuity enabling element includes a access transfer update – session transfer identifier element.

16. The system according to any of claims 9 to 15, wherein the system comprises at least one network element or function of the communication network, wherein

the communication element includes a user equipment configured to communicate via packet switched connectivity,

the access transfer control function includes an control function located in a serving network part,

the call session control function of the IP multimedia network includes one or more of an interrogating call session control function, a proxy call session control function and a serving call session control function;

the service continuity enabling element of the IP multimedia network includes a service centralization and continuity application server; and

the database for subscriber information related to the communication element includes a home subscriber server, wherein

a control network element of the first access domain includes a mobility management element, and

a control network element of the second access domain includes a mobile switching center.

17. A method including

receiving, when conducting a registration procedure for a communication element for acquiring packet switched connectivity in a communication network via an IP multimedia network, wherein the communication network is configured to execute an extended call continuity procedure and a non-extended call continuity procedure for transferring access of at least one media path of the communication element from a first access domain to a second access domain, an identifier for an access transfer control function used for directing a signaling to the access transfer control function;

initiating a registration of the communication element at a service continuity enabling element of the IP multimedia network;

requesting, on the basis of the identifier for the access transfer control function, address information of the access transfer control function from a database for subscriber information, and for requesting, from the database for subscriber information, an access transfer information element used for directing signaling to a service continuity enabling element and associated with the identifier for the access transfer control function; and

receiving the address information of the access transfer control function and the access transfer information element used for directing signaling to the service continuity enabling element and associated with the identifier for the access transfer control function.

18. The method according to claim 17, wherein

the requesting of the access transfer information element includes one of

sending, with the request for the address information of the access transfer control function, an indication for an ability to change the extended call continuity procedure to a non-extended call continuity procedure, wherein the access transfer information element used for directing signaling to the service continuity enabling element is transmitted to the call session control function of the IP multimedia network together with the identifier for the access transfer control function, and

sending a dedicated message for requesting transmission of the access transfer information element used for directing signaling to the service continuity enabling element when it is determined that the access transfer control function is not reachable, wherein the access transfer information element used for directing signaling to the service continuity enabling element is transmitted to the call session control function of the IP multimedia network in response to the dedicated message.

19. The method to any of claims 16 and 17, further including

sending, when executing the extended call continuity procedure, a session transfer request to the access transfer control function,

determining that the access transfer control function is not reachable,

changing a processing from an execution of the extended call continuity procedure to an execution of a non-extended call continuity procedure,

sending the session transfer request to the service continuity enabling element by using the access transfer information element, and

providing an indication for the change to the non-extended call continuity procedure to the service continuity enabling element.

20. An apparatus including

means for receiving, when conducting a registration procedure for a communication element for acquiring packet switched connectivity in a communication network via an IP multimedia network, wherein the communication network is configured to execute an extended call continuity procedure and a non-extended call continuity procedure for transferring access of at least one media path of the communication element from a first access domain to a second access domain, an identifier for an access transfer control function used for directing a signaling to the access transfer control function;

means for initiating a registration of the communication element at a service continuity enabling element of the IP multimedia network;

means for requesting, on the basis of the identifier for the access transfer control function, address information of the access transfer control function from a database for subscriber information, and for requesting, from the database for subscriber information, an

access transfer information element used for directing signaling to a service continuity enabling element and associated with the identifier for the access transfer control function; and

means for receiving the address information of the access transfer control function and the access transfer information element used for directing signaling to the service continuity enabling element and associated with the identifier for the access transfer control function.

21. The apparatus according to claim 20, wherein

the means for requesting are configured to request the access transfer information element by one of

sending, with the request for the address information of the access transfer control function, an indication for an ability to change the extended call continuity procedure to a non-extended call continuity procedure, wherein the access transfer information element used for directing signaling to the service continuity enabling element is transmitted to the call session control function of the IP multimedia network together with the identifier for the access transfer control function, and

sending a dedicated message for requesting transmission of the access transfer information element used for directing signaling to the service continuity enabling element when it is determined that the access transfer control function is not reachable, wherein the access transfer information element used for directing signaling to the service continuity enabling element is transmitted to the call session control function of the IP multimedia network in response to the dedicated message.

22. The apparatus to any of claims 20 and 21, further including

means for sending, when executing the extended call continuity procedure, a session transfer request to the access transfer control function,

means for determining that the access transfer control function is not reachable,

means for changing a processing from an execution of the extended call continuity procedure to an execution of a non-extended call continuity procedure,

means for sending the session transfer request to the service continuity enabling element by using the access transfer information element, and

means for providing an indication for the change to the non-extended call continuity procedure to the service continuity enabling element.

23. A method including

determining, when conducting a registration procedure for a communication element for acquiring packet switched connectivity in a communication network via an IP multimedia network, wherein the communication network is configured to execute an extended call

continuity procedure and a non-extended call continuity procedure for transferring access of at least one media path of the communication element from a first access domain to a second access domain, an access transfer information element used for directing signaling to a service continuity enabling element; and

causing storing of the access transfer information element and an identifier for an access transfer control function in association with each other in a database for subscriber information related to the communication element.

24. The method according to claim 23, further including

receiving and processing a session transfer request from a call session control function of the IP multimedia network regarding a session in which an access transfer control function is included;

determining, on the basis of an indication for a change to the non-extended call continuity procedure, that a non-extended call continuity procedure is to be executed; and

conducting, for executing the non-extended call continuity procedure, a processing for transferring the access domain from the first access domain to the second access domain without the access transfer control function.

25. The method according to claim 24, wherein

the processing for transferring the access domain from the first access domain to the second access domain according to the non-extended call continuity procedure further includes

conducting a remote leg update for changing connection to a control network element of the second access domain, and

cancelling an access source leg to the access transfer control function.

26. An apparatus including

means for determining, when conducting a registration procedure for a communication element for acquiring packet switched connectivity in a communication network via an IP multimedia network, wherein the communication network is configured to execute an extended call continuity procedure and a non-extended call continuity procedure for transferring access of at least one media path of the communication element from a first access domain to a second access domain, an access transfer information element used for directing signaling to a service continuity enabling element; and

means for causing storing of the access transfer information element and an identifier for an access transfer control function in association with each other in a database for subscriber information related to the communication element.

27. The apparatus according to claim 26, further including

means for receiving and processing a session transfer request from a call session control function of the IP multimedia network regarding a session in which an access transfer control function is included;

means for determining, on the basis of an indication for a change to the non-extended call continuity procedure, that a non-extended call continuity procedure is to be executed; and

means for conducting, for executing the non-extended call continuity procedure, a processing for transferring the access domain from the first access domain to the second access domain without the access transfer control function.

28. The apparatus according to claim 27, wherein

the processing for transferring the access domain from the first access domain to the second access domain according to the non-extended call continuity procedure further includes

conducting a remote leg update for changing connection to a control network element of the second access domain, and

cancelling an access source leg to the access transfer control function.

29. A computer program product for a computer, including software code portions for performing the steps of any of claims 1 to 9 or any of claims 17 to 19 or any of claims 23 to 25 when said product is run on the computer.

30. The computer program product according to claim 29, wherein

the computer program product includes a computer-readable medium on which said software code portions are stored, and/or

the computer program product is directly loadable into the internal memory of the computer and/or transmittable via a network by means of at least one of upload, download and push procedures.

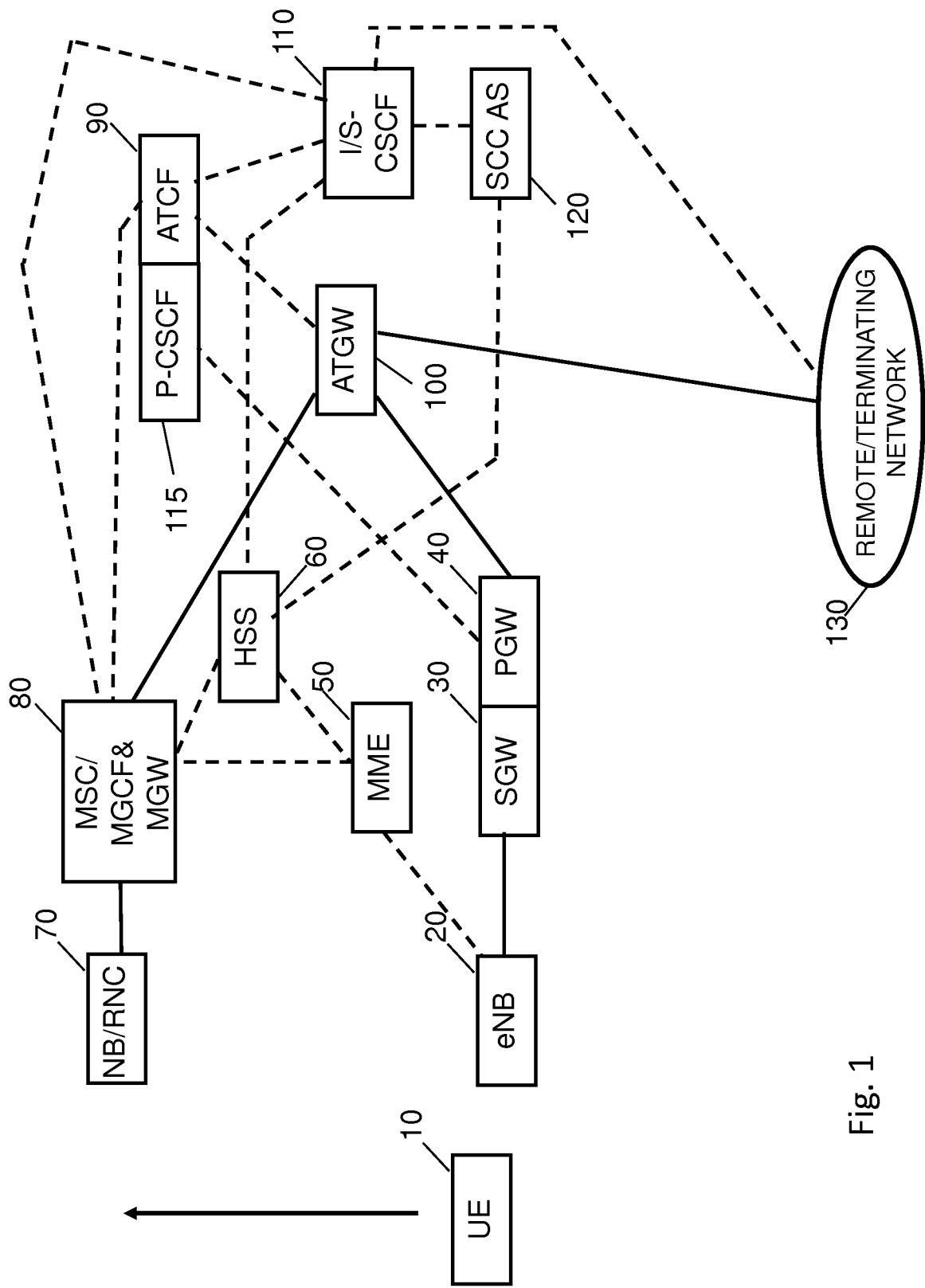


Fig. 1

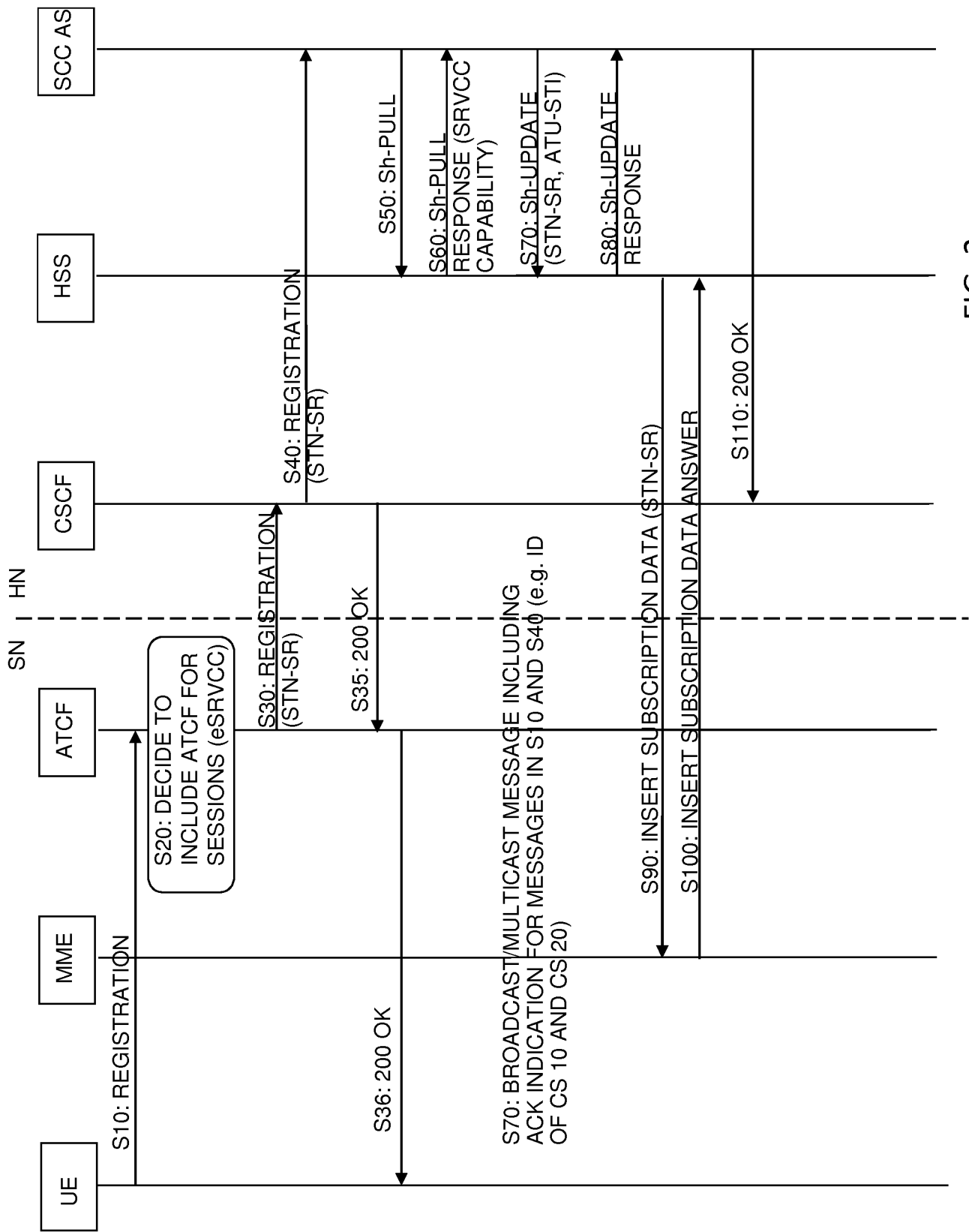


FIG. 2

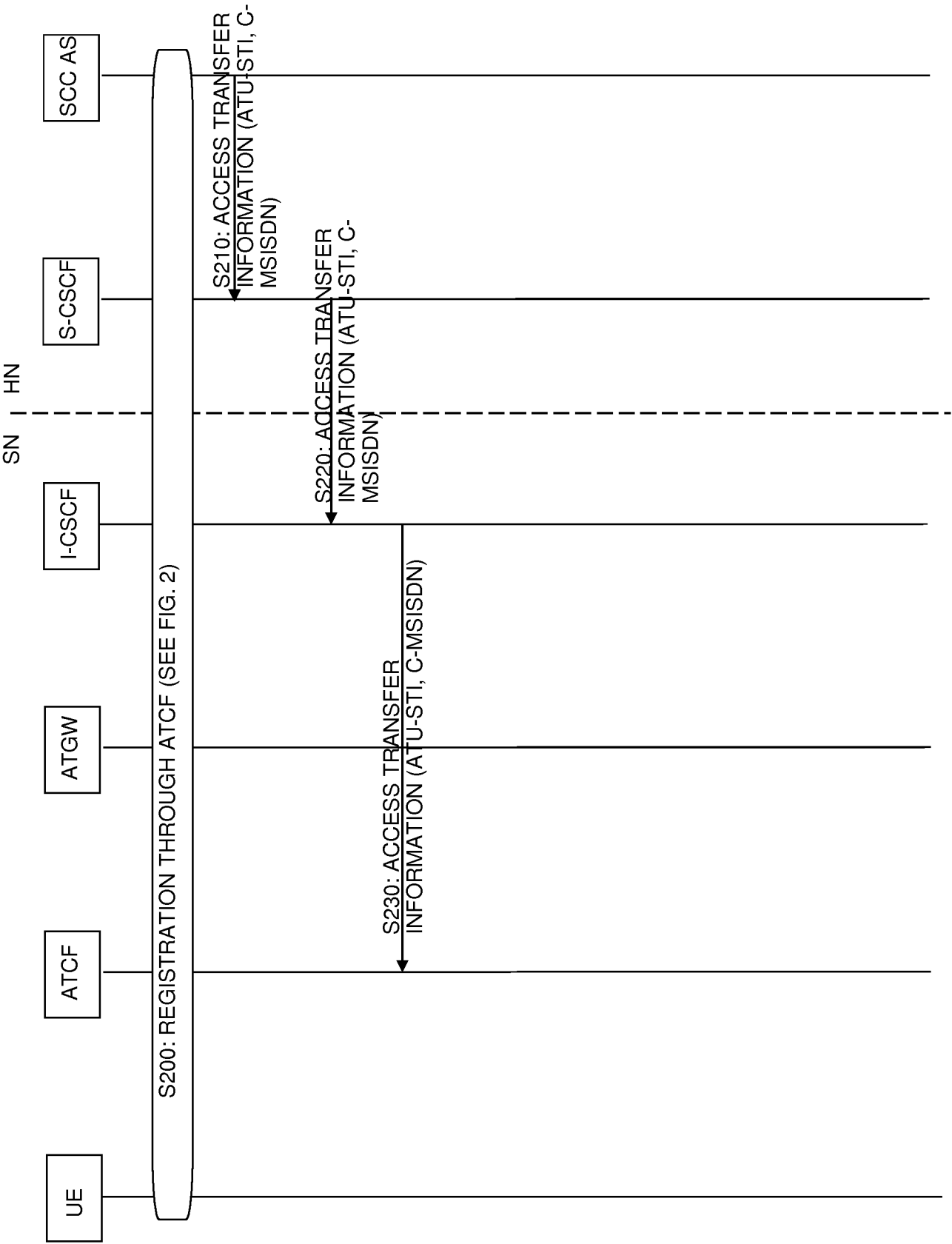


FIG. 3

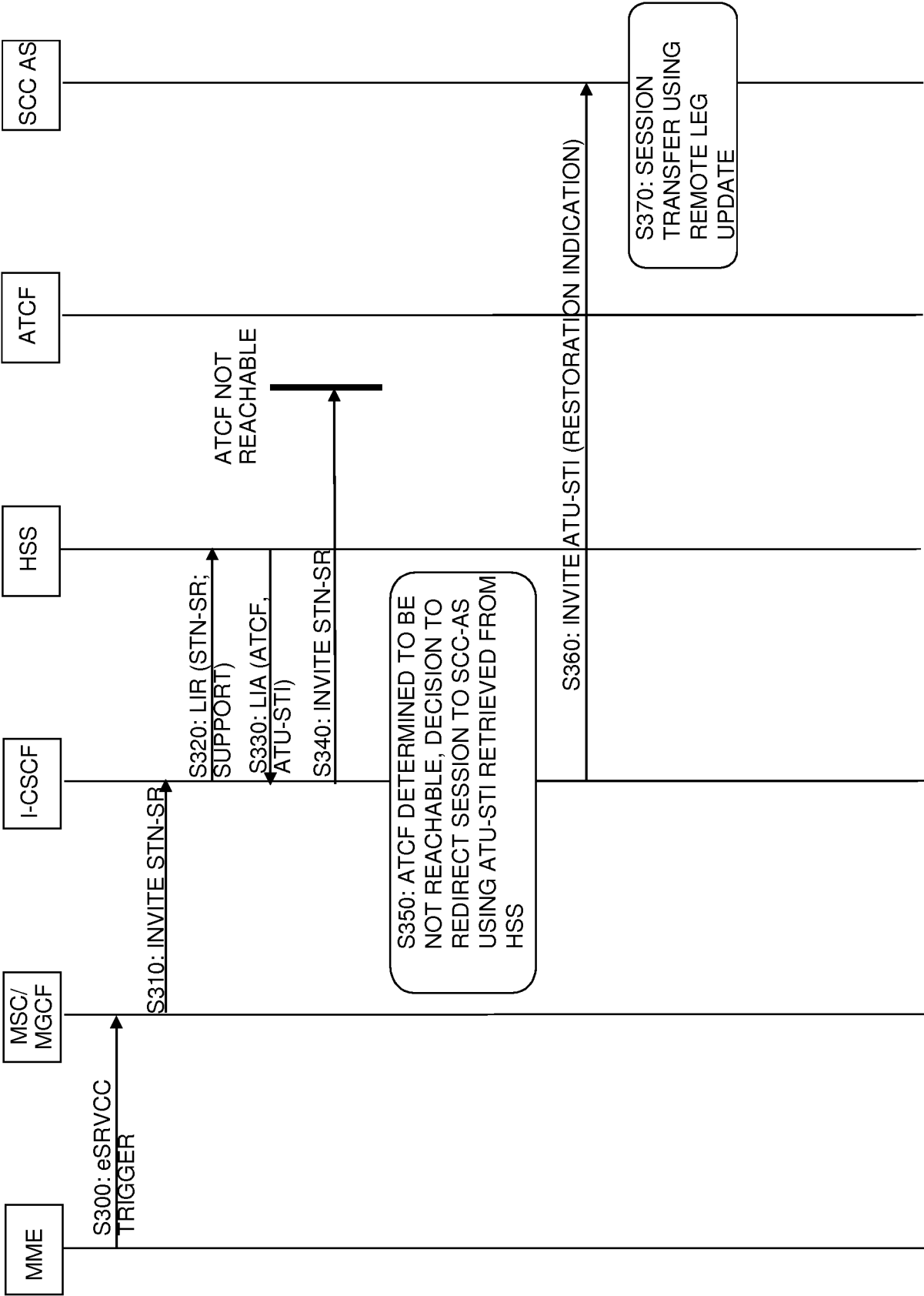


FIG. 4

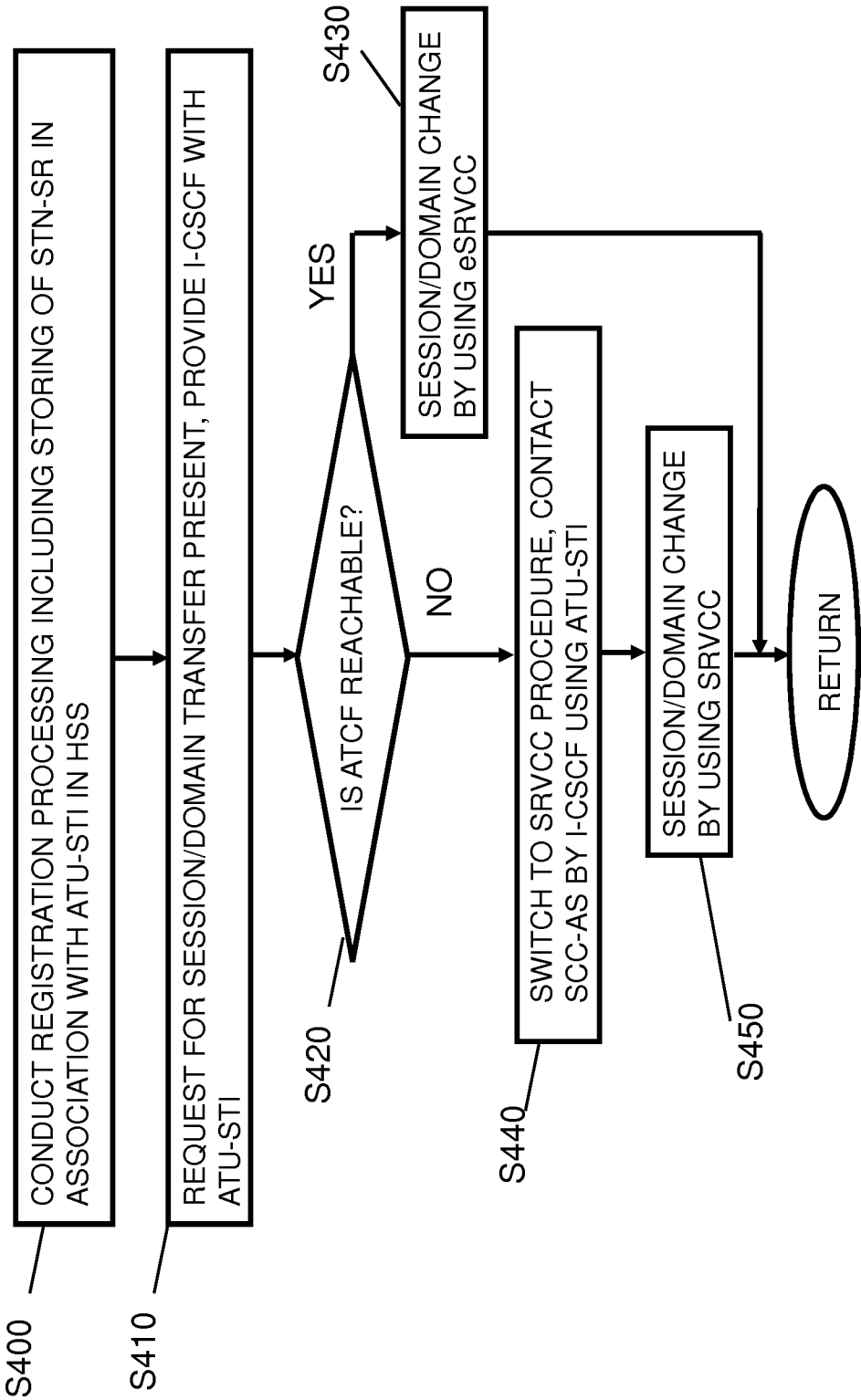


Fig. 5

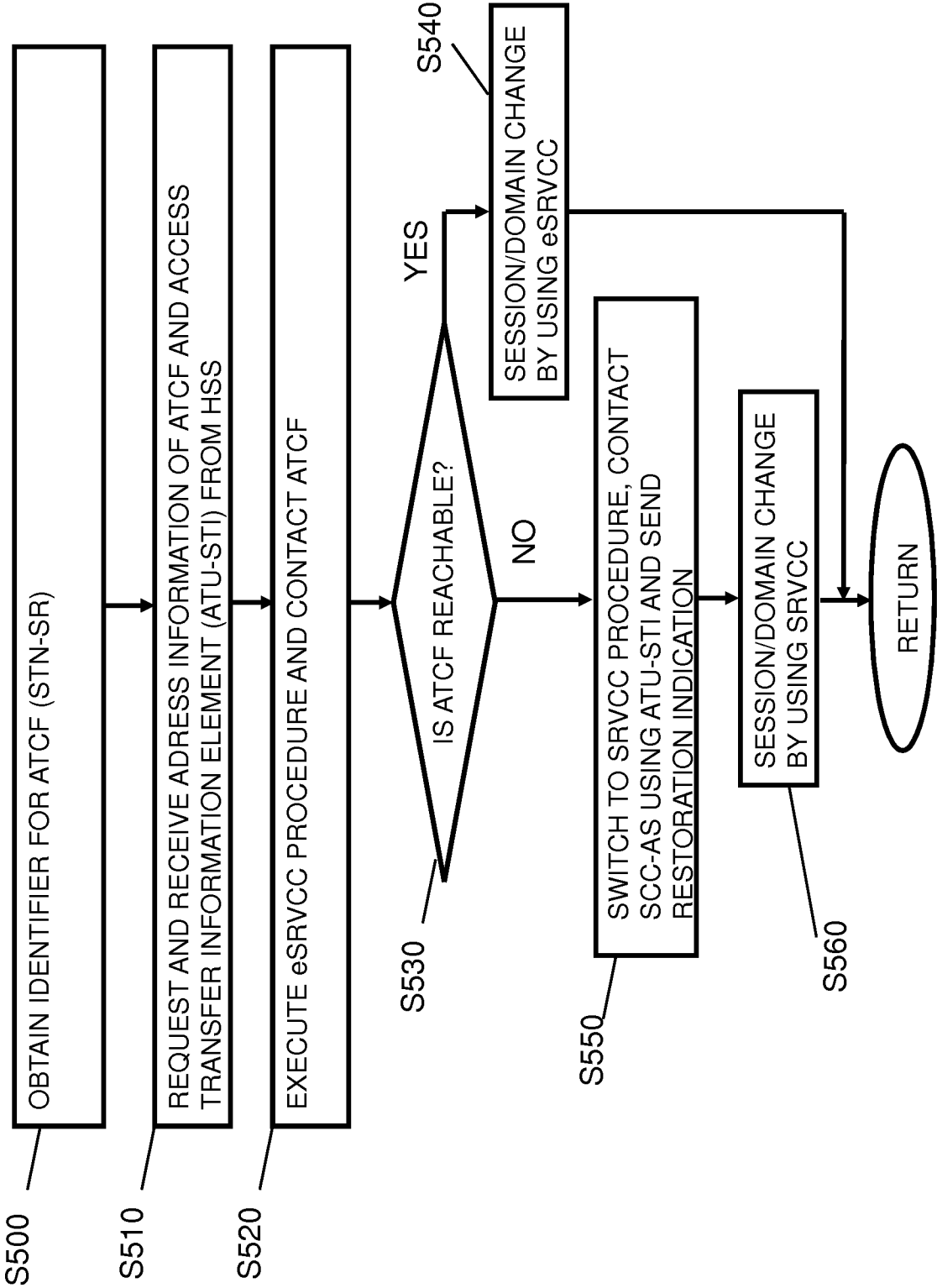


Fig. 6

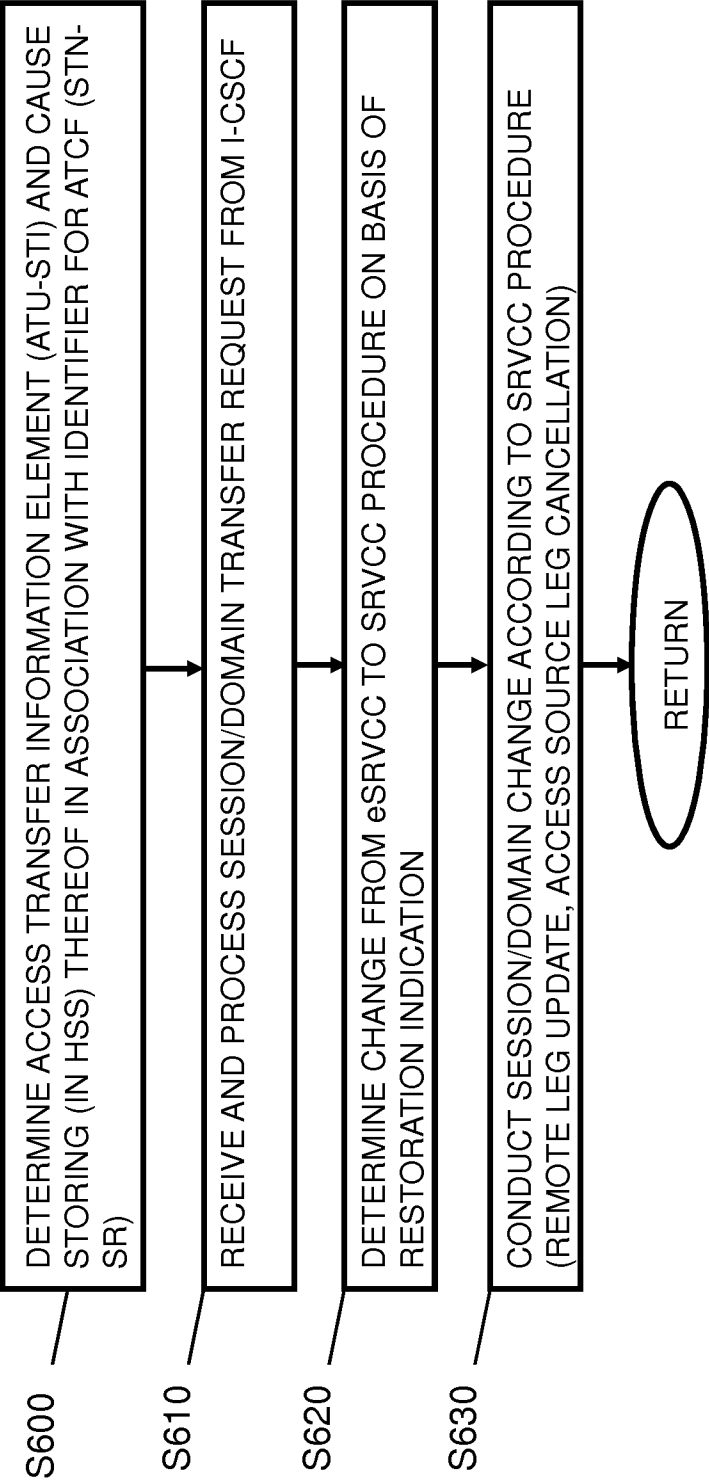


Fig. 7

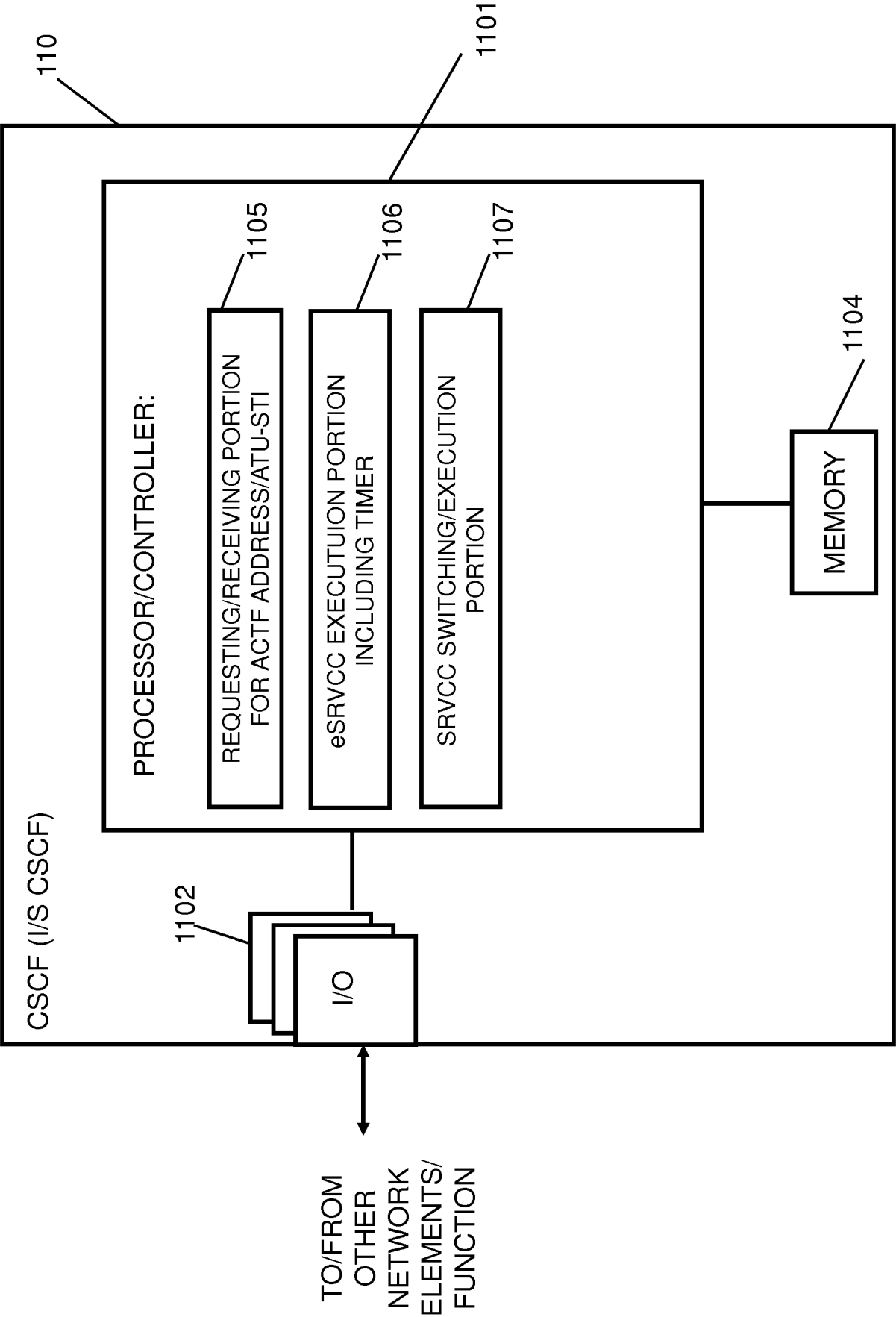


Fig. 8

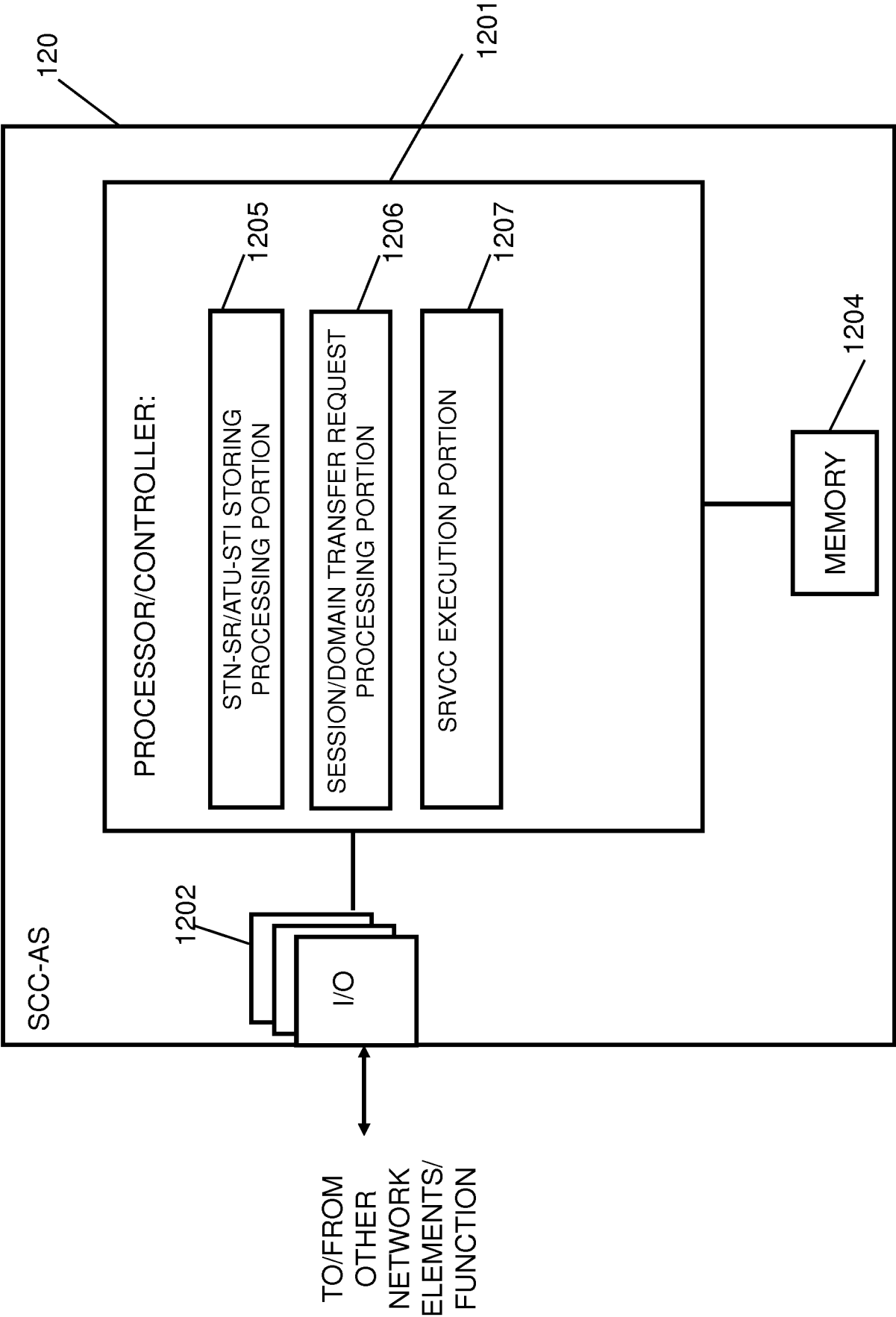


Fig. 9

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2016/054627

A. CLASSIFICATION OF SUBJECT MATTER
INV. H04L29/06 H04W36/00 H04W36/14
ADD.

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 H04W

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 2 903 319 A1 (ZTE CORP [CN]) 5 August 2015 (2015-08-05) page 2, column 1, paragraph 2 - column 2, paragraph 8 page 4, column 6, paragraph 27 - page 6, column 9, paragraph 35 page 7, column 12, paragraph 52 - page 9, column 16, paragraph 60 -----	1-30
A	WO 2013/156061 A1 (ERICSSON TELEFON AB L M [SE]; GUSTAVSSON LEIF [SE]; ABTIN AFSHIN [SE];) 24 October 2013 (2013-10-24) page 11, line 7 - page 13, line 30 ----- -/--	1-30



Further documents are listed in the continuation of Box C.



See patent family annex.

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Date of the actual completion of the international search

7 November 2016

Date of mailing of the international search report

16/11/2016

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040,
Fax: (+31-70) 340-3016

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Karavassilis, Nick

INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2016/054627

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	ERICSSON ET AL: "ATU-STI alignments and corrections", 3GPP DRAFT; S2-121410_23_237 RSRVCC ATU-STI CLARIFICATIONS, 3RD GENERATION PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE CENTRE ; 650, ROUTE DES LUCIOLES ; F-06921 SOPHIA-ANTIPOLIS CEDEX ; FRANCE, vol. SA WG2, no. Bratislava, Slovakia; 20120416 - 20120420, 11 April 2012 (2012-04-11), XP050631913, [retrieved on 2012-04-11] the whole document -----	1-30
A	"3rd Generation Partnership Project; Technical Specification Group Core Network and Terminals; Study on SCC AS Restoration; (Release 13)", 3GPP DRAFT; 29812-D00, 3RD GENERATION PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE CENTRE ; 650, ROUTE DES LUCIOLES ; F-06921 SOPHIA-ANTIPOLIS CEDEX ; FRANCE , 18 December 2015 (2015-12-18), XP051062950, Retrieved from the Internet: URL:http://www.3gpp.org/ftp/tsg_ct/WG4_protocolcollars_ex-CN4/TSGCT4_71ah_Nashville/Draft_Specs_after_CT70/ [retrieved on 2015-12-18] page 7, paragraph 5. - page 9, line END -----	1-30

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2016/054627

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			EP	2903319 A1		05-08-2015
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			WO	2014048331 A1		03-04-2014

WO 2013156061	A1	24-10-2013	NONE			
