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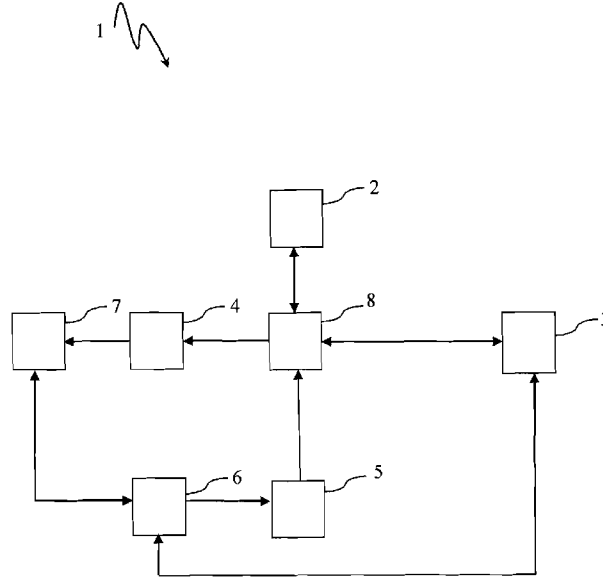


Figure 1

(57) Abstract: The present invention relates to a system and method for detecting call bypass frauds which are connected to the called subscriber by making domestic call upon bypassing the call to the SIM Box system -wherein a SIM card registered to a domestic operator is inserted- through VoIP while carrying out call set-up among international GSM operators. The inventive system (1) consists of database (2), HLR (3), call initiation module (4), call reception module (5), MSC (6), international carrier (7) and SIM Box detection unit (8).



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A SYSTEM AND METHOD FOR DETECTING CALL BYPASS FRAUD IN MOBILE COMMUNICATION NETWORKS

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Technical Field

The present invention relates to a system and method for detecting call bypass frauds which are connected to the called subscriber by making domestic call upon
10 bypassing the call to the SIM Box system –wherein a SIM card registered to a domestic operator is inserted– through VoIP (Voice over Internet Protocol) while carrying out call set-up among international GSM (Global System for Mobile Communications) operators.

15 Background of the Invention

Due to the fact that GSM operators use their own infrastructures in domestic calls or because of mutual agreements made with other operators, service fee is significantly low than in comparison to international calls. Besides this service fee
20 difference, the fact that payment protocols among operators providing service in different countries becomes difficult depending on increasing number of operators causes third persons or institutions to be involved in payment transactions. This situation provides opportunity for persons or institutions aiming to take advantage of system vulnerability. Calls received from abroad are indicated as domestic calls
25 by forwarding inter-operator calls by use of devices such as SIM Box (Subscriber Identity Module Box) commonly known today. In this case, payment that should be made to the operator receiving the call is made to third persons or institutions in between thereof while carrying out forwarding. This situation which is commonly encountered particularly in international calls leads to unofficial money flow and
30 tax losses on a national basis. In addition to these, it may also lead to revenue loss

in operators, reduction in network's service quality reflected to customer and unnecessary infrastructure investments by considering that this reduction originates from the network. Because of these reasons, operators make a great effort in order to detect and prevent fraud realized by means of such illegal call bypass.

5

In the common usage included in the state of the art, test calls are made to the numbers registered in the operator in order to determine the SIM (Subscriber Identity Module) cards purchased from the operator to make call bypass fraud on the desired network. In these calls made by using special test SIM cards, in the event
10 that the CLI (Calling Line Identity) code cannot be carried to the called number, the number is taken under review on suspicion of fraud. In these usages, persons carrying out SIM Box fraud detect test calls and take measure for this situation.

In the state of the art, there are methods such as test call. However, these methods
15 remain incapable for detecting call bypass fraud since they cannot provide a large scale follow-up and blocking mechanism. Continuing revenue losses of telecommunication operators summarizes this situation. Therefore, need for a system which substantially detects call bypass frauds such as SIM Box is evident.

20 The United States patent document no. **US2012021720**, an application in the state of the art, discloses a system and method which enables to detect call bypass fraud by configuring descriptive information of the called number on the network before the test call is initiated.

25 The International patent document no. **WO2012080781**, another application in the state of the art, discloses a system and method which performs call bypass fraud by initiating test call to the numbers of the network periodically and tracking down the location information of the number.

30

Summary of the Invention

An objective of the present invention is to realize a system and method for detecting frauds made by means of call bypass (SIM Box, etc.) by following up network
5 signals in international calls.

Detailed Description of the Invention

“A System and Method for Detecting Call Bypass Fraud in Mobile Communication
10 Networks” realized to fulfil the objectives of the present invention is shown in the figures attached, in which:

Figure 1 is a schematic block diagram of the inventive system.

Figure 2 is a flow chart of the inventive method.

15

The components illustrated in the figures are individually numbered, where the numbers refer to the following:

1. System
- 20 2. Database
3. HLR (Home Location Register)
4. Call initiation module
5. Call reception module
6. MSC (Mobile Switching Center)
- 25 7. International carrier
8. SIM Box detection unit
100. Method

The inventive system (1) for detecting call bypass frauds in international calls
30 comprises:

- at least one database (2) which records calling and called numbers so as to initiate test call;
- at least one HLR (3) which comprises mobile number information recorded in to the network;
- 5 - at least one call initiation module (4) which can initiate call from the calling number –that is included in the database (2)– to the called number over a contracted international operator;
- at least one call reception module (5) wherein the call reaching the called number is forwarded;
- 10 - at least one MSC (6) which forwards the calls initiated on the network and the calls reaching the network;
- at least one international carrier (7) which receives and transmits international calls contracted with mobile operator;
- at least one SIM Box detection unit (8) which receives the T-CSI (Terminating CAMEL Subscriber Information) information –that is included on the HLR (3)– of the called number received from the database (2) and updates the MSC (6) in order that it forwards the call to the call reception module (5), transmits the information of the calling and the updated called number to the call initiation module (4), receives
- 15 the calling number information of the call reaching the call reception module (5) and compares it with the calling number information that it transmits to the call initiation module (4) (Figure 1).
- 20

The database (2) included in the inventive system (1) is a unit wherein the calling and the called numbers where the test call is initiated are recorded. The database (2) is also a unit wherein the fraud number detected by the SIM Box detection unit (8) is recorded.

The HLR (3) included in the inventive system (1) is a unit wherein all subscription information such as identification, network based location, service usage parameters belonging to all subscribers of the communication network are recorded.

5 The call initiation module (4) included in the inventive system (1) receives the information of the calling and the called number wherein the test call will be initiated from the SIM Box detection unit (8). The call initiation module (4) initiates call from the calling number towards the called number over an international contracted operator with the information of the calling and the called number
10 received. In one preferred embodiment of the invention, the call initiation module (4) carries out the call initiation transaction by using SIP (Session Initiation Protocol).

The call reception module (5) included in the inventive system (1) is a unit which
15 receives the calls forwarded to the called number wherein the test call is initiated. In the event that a call is forwarded to the called number, the call reception module (5) transmits the called number information to the SIM Box detection unit (8). In one preferred embodiment of the invention, the call reception module (5) is a unit which runs in connection with CAMEL (Customized Applications for Mobile
20 Enhanced Logic).

The MSC (6) included in the inventive system (1) is a unit which enables to forward calls made on the network to intra-network or non-network subscribers. The MSC (6) receives the calls coming from the international carrier (7) and performs
25 forwarding according to the called number information. In one preferred embodiment of the invention, the MSC (6) comprises definitions in order to forward the call to the call reception module (5) according to the T-CSI information that is located on the HLR (3) of the called number wherein the test call is made and that is updated by the SIM Box detection unit (8).

30

The international carrier (7) included in the inventive system (1) is a unit which receives and forwards international calls. The international carrier (7) transmits the call, which is initiated by the call initiation module (4) and transmitted by the contracted foreign mobile operator, to the MSC (6). Call bypass fraud is performed
5 by reaching the call –that is forwarded through the international carrier (7)– to the called number over another server (SIM Box) not forwarding it to the MSC (6).

The SIM Box detection unit (8) included in the inventive system (1) determines the calling and the called numbers for test call from the numbers included in the
10 database (2). The SIM Box detection unit (8) records the T-CSI information by receiving the HLR (3) records of the called number and allocates an up-to-date T-CSI information to the called number. Definitions made in the MSC (6) for the T-CSI value used ensure that the calls reaching the called number are forwarded to the call reception module (5) by the MSC (6). The SIM Box detection unit (8)
15 transmits the information of the calling and the up-to-date called number to the call initiation module (4).

The SIM Box detection unit (8) waits for the call initiated by the call initiation module (4), to be forwarded to the call reception module (5) together with the T-
20 CSI information allocated to the called number. In the event that the call is forwarded to the call reception module (5), the call reception module (5) transmits the called number information of the forwarded call to the SIM Box detection unit (8).

25 The SIM Box detection unit (8) compares the calling number information of the call forwarded by the call reception module (5) with the calling number information transmitted to the call initiation module (4). If the two numbers are the same as a result of the comparison, the SIM Box detection unit (8) decides that no call bypass fraud is made. If the two numbers are not the same as a result of the comparison,
30 the SIM Box detection unit (8) determines that the calling number of the call

forwarded to the call reception module (5) is forwarded and records the calling number information –that is transmitted by the call reception module (5)– by transmitting it to the database (2) as the fraud (SIM Box) number. Then, the SIM Box detection unit (8) changes the T-CSI information of the called number with the
5 previous value by querying the HLR (3).

With the inventive system (1), in calls made among international mobile operators, it is enabled to detect call bypass fraud which ensures that a call is realized as a domestic call upon being forwarded to a number recorded to a domestic network.

10

The inventive SIM Box fraud detection method (1) for detecting call bypass frauds in international calls comprises steps of:

- the SIM Box detection unit (8) receiving the calling and the called number information for the test call from the database (2) (101);
- 15 - the SIM Box detection unit (8) receiving the HLR (3) records of the called number (102);
- the SIM Box detection unit (8) recording the T-CSI information of the called number and allocating a new T-CSI to the called number (103);
- the SIM Box detection unit (8) transmitting the calling and the up-to-date called number information for the test call from the database (2)
20 (104);
- the call initiation module (4) initiating a call from the calling number to the called number over a contracted foreign network (105);
- the international carrier (7) forwarding the initiated call to the MSC (6)
25 (106);
- the MSC (6) detecting the call initiated to the called number having the T-CSI information allocated by the SIM Box detection unit (8) and forwarding it to the call reception module (5) (107);

- the call reception module (5) transmitting the calling number information of the forwarded call, to the SIM Box detection unit (8) (108);
 - 5 - the SIM Box detection unit (8) comparing the calling number information sent to the call initiation module (4) and transmitted by the call reception module (5) (109);
 - 10 - if it is detected that the calling numbers are not the same as a result of the comparison, the SIM Box detection unit (8) determining the calling number information transmitted by the call reception module (5) as the fraud (SIM Box) number and recording it to the database (2) (110);
 - the SIM Box detection unit (8) restoring the T-CSI information of the called number to its initial state by initiating a query to the HLR (3) and terminating the transaction (111).
- 15 With the inventive call bypass fraud method (100), in calls made among international mobile operators, it is enabled to detect call bypass fraud which ensures that a call is realized as a domestic call upon being forwarded to a number recorded to a domestic network.
- 20 It is possible to develop various embodiments of the inventive system (1) and method (100), the invention cannot be limited to examples disclosed herein and it is essentially according to claims.

CLAIMS

1. A system (1) for detecting call bypass frauds in international calls; **comprising**
- at least one database (2) which records calling and called numbers so as to initiate test call;
 - at least one HLR (3) which comprises mobile number information recorded in to the network;
 - at least one call initiation module (4) which can initiate call from the calling number –that is included in the database (2)– to the called number over a contracted international operator;
 - at least one call reception module (5) wherein the call reaching the called number is forwarded;
 - at least one MSC (6) which forwards the calls initiated on the network and the calls reaching the network;
 - at least one international carrier (7) which receives and transmits international calls contracted with mobile operator;
- and **characterized by**
- at least one SIM Box detection unit (8) which receives the T-COI (Terminating CAMEL Subscriber Information) information –that is included on the HLR (3)– of the called number received from the database (2) and updates the MSC (6) in order that it forwards the call to the call reception module (5), transmits the information of the calling and the updated called number to the call initiation module (4), receives the calling number information of the call reaching the call reception module (5) and compares it with the calling number information that it transmits to the call initiation module (4).
2. A system (1) according to Claim 1; **characterized by** the call initiation module (4) which carries out the call initiation transaction from the calling number to the called number by using SIP.

3. A system (1) according to Claim 1; **characterized by** the MSC (6) which forwards the call to the call reception module (5) according to the T-CSI information that is located on the HLR (3) of the called number wherein the test
5 call is made and that is updated by the SIM Box detection unit (8).
4. A system (1) according to Claim 1; **characterized by** the SIM Box detection unit (8) which determines that the calling number of the call forwarded to the call reception module (5) is forwarded and transmits the calling number
10 information transmitted by the call reception module (5) to the database (2) as the fraud (SIM Box) number, in the event that the calling number information transmitted to the call initiation module (4) and received from the call reception module (5) are not the same.
- 15 5. A system (1) according to Claim 1; **characterized by** the SIM Box detection unit (8) which takes the T-CSI information of the called number to its previous value by querying the HLR (3) after it makes comparison of the calling number information transmitted to the call initiation module (4) and received from the call reception module (5).
- 20 6. A detection method for call bypass fraud (1) enabling to detect call bypass fraud in international calls; **characterized by** steps of:
- the SIM Box detection unit (8) receiving the calling and the called number information for the test call from the database (2) (101);
 - 25 - the SIM Box detection unit (8) receiving the HLR (3) records of the called number (102);
 - the SIM Box detection unit (8) recording the T-CSI information of the called number and allocating a new T-CSI to the called number (103);

- the SIM Box detection unit (8) transmitting the calling and the up-to-date called number information for the test call from the database (2) (104);
- 5 - the call initiation module (4) initiating a call from the calling number to the called number over a contracted foreign network (105);
- the international carrier (7) forwarding the initiated call to the MSC (6) (106);
- the MSC (6) detecting the call initiated to the called number having the T-CSI information allocated by the SIM Box detection unit (8) and forwarding it to the call reception module (5) (107);
- 10 - the call reception module (5) transmitting the calling number information of the forwarded call, to the SIM Box detection unit (8) (108);
- the SIM Box detection unit (8) comparing the calling number information sent to the call initiation module (4) and transmitted by the call reception module (5) (109);
- 15 - if it is detected that the calling numbers are not the same as a result of the comparison, the SIM Box detection unit (8) determining the calling number information transmitted by the call reception module (5) as the fraud (SIM Box) number and recording it to the database (2) (110);
- 20 - the SIM Box detection unit (8) restoring the T-CSI information of the called number to its initial state by initiating a query to the HLR (3) and terminating the transaction (111).

Figure 1

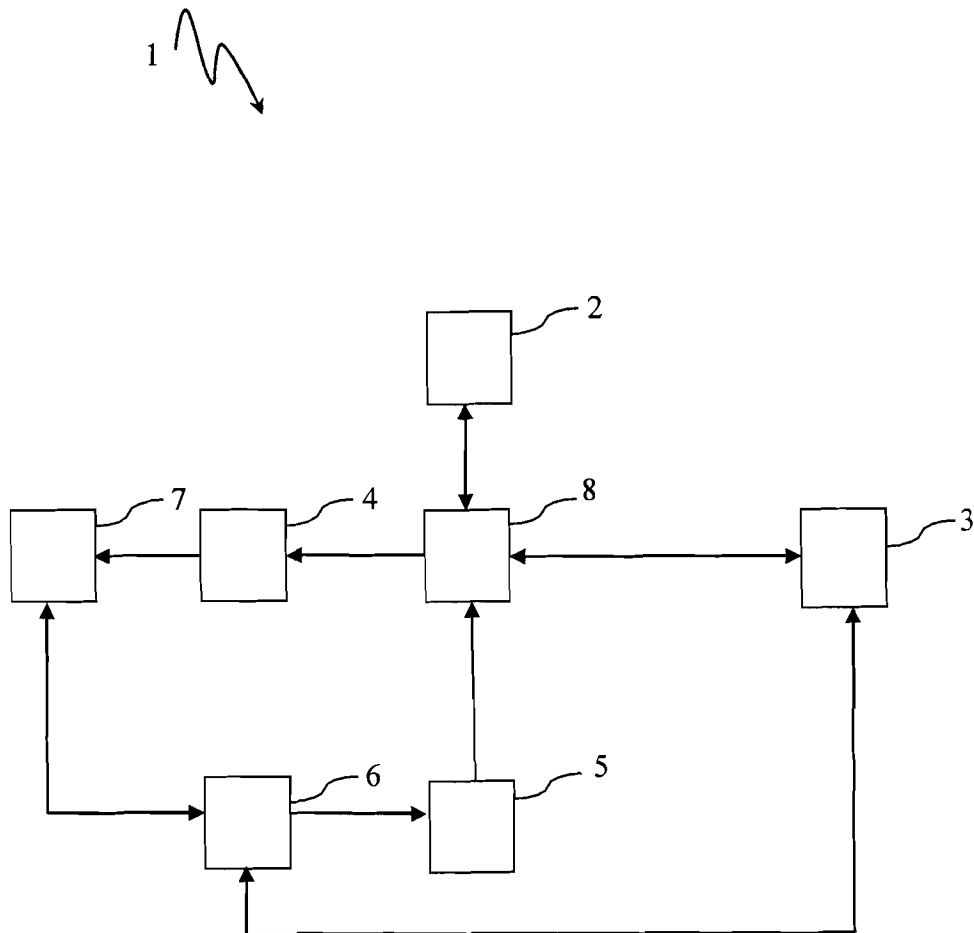


Figure 2

