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Customized service announcements on 4G and 5G without compromising location privacy

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- **Title:** Customized service announcements on 4G and 5G without compromising location privacy.

- **Abstract:**

A method and system that will allow the subscribers to manage their own announcements for various subscription or network services like busy or out of network or switched off or even not reachable in the IMS (IP Multimedia Subsystem) over 4G and 5G network without revealing any kind of location information.

- **Problem Solved:**

Telecommunication services are commonly categorized into basic, value added services, supplementary services, etc. Few of the services are defined in 3GPP TS 22.004 like Call Forwarding, Call Waiting, Call Barring, Multi Party Service, Call Deflection, Calling Line Identification, CCBS (Completion of Calls to Busy Subscriber), etc.

Service provider networks are generally divided into multiple regions, zones, circles, etc. It is very much possible that the implementation of same service varies in different regions, etc. sometimes due to multi-vendor approach for the same network entity or need of the region.

The subscriber or calling party receive various announcements depending on the network state and also during various states of the called parties like busy or out of network or switched off or not reachable, in all these scenarios there is default network announcement played, the subscriber doesn't have any mechanism to select the announcements. In some cases the announcements for same situation contrasts the content and language based on the geographical location (zone or circle or region) the called party is currently present.

These announcement can also provide the called party probable location or roaming region details, as announcements are based on the languages corresponding to the location in which the called party is present, For example Subscriber 'A' from region 'X' roaming in a region 'Y', and if another subscriber 'B' from region 'X' calls the subscriber 'A', consider the subscriber 'A' is already on another call or busy or not reachable, etc. the subscriber 'B' will listen the announcements implemented in the region 'Y' which can be in different language or announcement compared to what got implemented in region 'X'. Without completing the call the Subscriber 'B' can easily guess the location of the called party.

It is very simple to map the language with the region and this information may expose the presence of the subscriber in a given region and this location related data that can be used in multiple ways.

Currently there is no defined mechanism for the subscribers to manage, control or configure service announcements provided by the service providers.

- **Prior Solutions:**

  Few of the solutions are listed below mainly related to announcements received by the subscriber during various situations of the called party and network.

  a. One of the basic solution is whenever called party is busy or out of network or not reachable a pre-defined network tone or announcement will be played to the calling party (patent WO2000062524A1 Ring back tone/busy tone selection). Same logic applies to when calling party is barred for outgoing or called party barred for incoming calls. These announcements are default and there is no mechanism for the subscriber to manage or configure them.

  b. Another solution is to send the text to the calling party about the busy status of the called party, this solution is applicable only for a given service not for all the services and works only when the calling party has a text telephone device. (reference patent no US 7158617)

  c. The announcements language is not always same in a service providers network, as it depends on the region the Called Party last registered or currently present, and in all the cases the announcement is same for all the called parties present in that region and there is no way the called party can override the announcements. There is another solution in which the announcements will be in two languages, first one based on regional language and other one based on country. Problem described above still holds good in this solution as well due to regional language.

- **Description:**

  Over the years' telco service providers has introduced new and innovative services to attract users, these services play a significant role in order to differentiate service providers based on their offerings to the customers. Most of the service providers also tries to implement a mode so that services can be managed by the subscribers directly by using their mobile phones or any other devices. Subscribers can opt their services either by requesting at the time of connection or later depends on the mechanisms provided by the service providers to control certain services.

  Few of such services need announcements, which can be either an audio announcement or a video clip, these announcements are used to report the progress of the request or sometimes provide possible reason of the rejection.

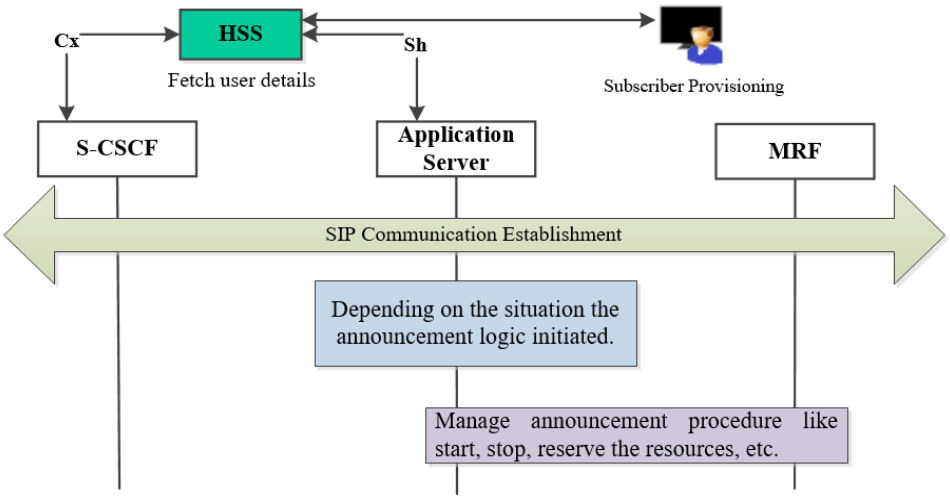

Figure 1

As of now majority of the announcements are not exposed for the subscribers to manage or configure. The current functionality is shown in Figure 1 in this S-CSCF interacts with HSS for registration and de-registration, and AS (Application Server) interacts with HSS to get the user profile or services subscription details and responsible for services. S-CSCF also interacts with TAS over SIP interface based on iFC's (Initial Filter Criteria) received from the HSS over Cx interface. Once the SIP communication establishes the application server service logic decides to initiate the announcement, the application server provides all the necessary media parameters (IP address, port, etc.) to the MRF. There are certain scenarios in which application server itself can provide the media file details in the Alert-Info header by including a media file URL.

With this approach there is no service announcement differentiation, all the announcements for a given service remains same for all the calling party trying to make calls to the parties present/registered in a given region. As mentioned in the problem statement, it can possible expose/reveal the regional location where the called party currently present, and there is no way to manage and configure the announcements, some cases there are also issues in understanding the announcement language itself.

A new method can be implemented for the subscribers to manage their own announcements for various subscribed services like Call Busy, Call forwarding, Out of network, Call barring, etc. services. This method can be implemented by improving the functionalities of existing network entities HSS (Home Subscriber Server), AS (Application Server) and MRF (Media Resource Function). As IMS (IP Multimedia Subsystem) provides multiple services one of them is voice capabilities in 4G network, IMS is also applicable to 5G network as well, and this proposed method will work on both 4G and 5G, as explained in below scenarios.

Below is explained how the proposed method will work for the 4G subscriber (Figure 2)

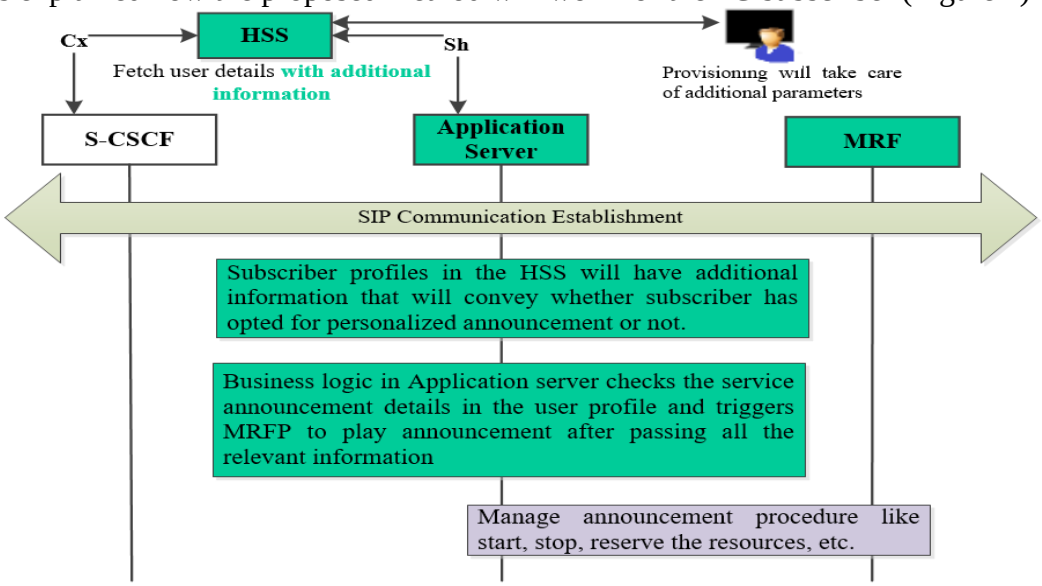

Figure 2

a. HSS will allow to provision subscriber service level additional flag for each and every service, the flag value will govern the logic in the network whether the subscriber has subscribed the specific announcement or not.

b. Once the application server download's the subscriber profile, the TAS will know the details of the services and announcement configuration.

c. A service logic will be implemented at application server, whenever there is a need to play announcement, the logic will first look into the subscriber profile and if the subscriber has subscribed to the specific announcement, the application server will trigger the MRF with required details to manage the subscriber specific announcement, in case if the subscriber hasn't subscribed to the personalized announcement, the application server will trigger the default announcement. There can be multiple ways to provision the announcements either it can be going through portal or self-service IVR, etc.

Same method should also work for the 5G subscriber as shown in Figure 3 with an extra flow of messages from HSS to UDM (User Data management) to UDR (Unified Data Repository), as 5G standards are evolving and interface details between HSS ←→ UDM is just a reference, it is very much possible that HSS can request the 5G profile from UDM and later provide the details to the Application server as described in the above figure. There are various other solutions described in 3GPP 23.732, but proposed method is expected to work for all the solutions.

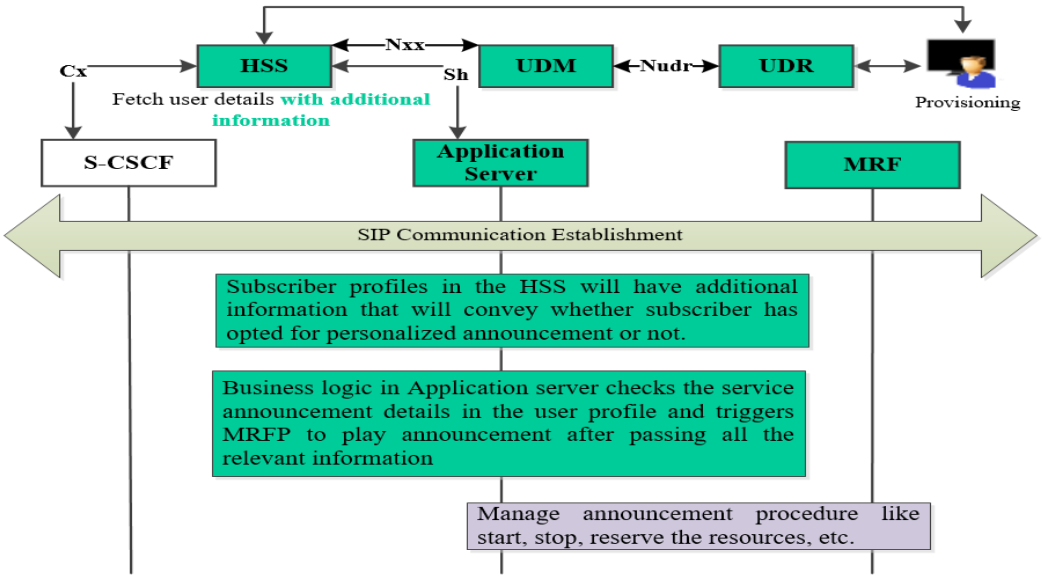

Figure 3

- **Advantages:**

Subscribers will be interested in this kind of functionalities and service providers or operators can consider this as a revenue generation service.

This method can be made configurable to provide flexibility to the operators to manage individual or given set of subscribers.

This method can add distinctive functionalities in few of the telco network functions, like HLR, HSS, TAS, MRF, etc.

Method will be applicable to 4G and evolving 5G as described in the document.