Technical Disclosure Commons

December 2021

Fast Emergency Call Retry When Timer T3230 is Expired

Edison Chen

Shih-Che Chou

Follow this and additional works at: https://www.tdcommons.org/dpubs_series

FAST EMERGENCY CALL RETRY WHEN TIMER T3230 IS EXPIRED

Abstract

When attempting an emergency call using a third generation (3G) radio access technology (RAT), a user equipment (UE) uses the otherwise idle period following initiation of the T3240 timer to attempt to establish the emergency call using one or both of a different RAT or a different network via a different subscriber identity module (SIM).

Background

Universal Mobile Telecommunication System (UTMS) and other 3G cellular protocols make use of timers to control operation of a UE in various situations. In particular, 3G relies on a pair of timers, T3230 and T3240, to control the timing of operation of a UE when attempting an emergency cellular connection (ECC) call. FIG. 1 below illustrates the typical sequence of actions between the modem stack of a UE ("UE Stack1") and a cellular network ("NW"). When initiating an ECC call, the UE modem stack arranges for the transmission of a cellular message (CM) service request and starts the T3230 timer, which is used to define the duration (typically 15 seconds) that the UE should wait for an outgoing mobility management (MM) connection from the network. When there is no response from the network by the time the T3230 timer expires, the UE releases the connection and starts the T3240 timer to wait for a network response. However, as indicated by the highlighted element (and marked as "A" in FIG. 1), while the timer T3240 is started but not yet expired, the UE is prohibited by 3G protocols from scanning for other signals from the network, and thus has to wait for the T3240 timer to expire before doing so. As the T3240 typically is defined as a 10-second timer, this wait for the T3240 timer to expire can significantly delay the establishment of an ECC call.

EMC scaning need to wait for T3240 expired

UE Stack1   NW

Ecc call request

CM service request

start T3230

No response

T3230 expired

UE release the connection

(A) start T3240

UE can not scan signal for ECC

T3240 expired

Connection is released

UE can scan signal for ECC
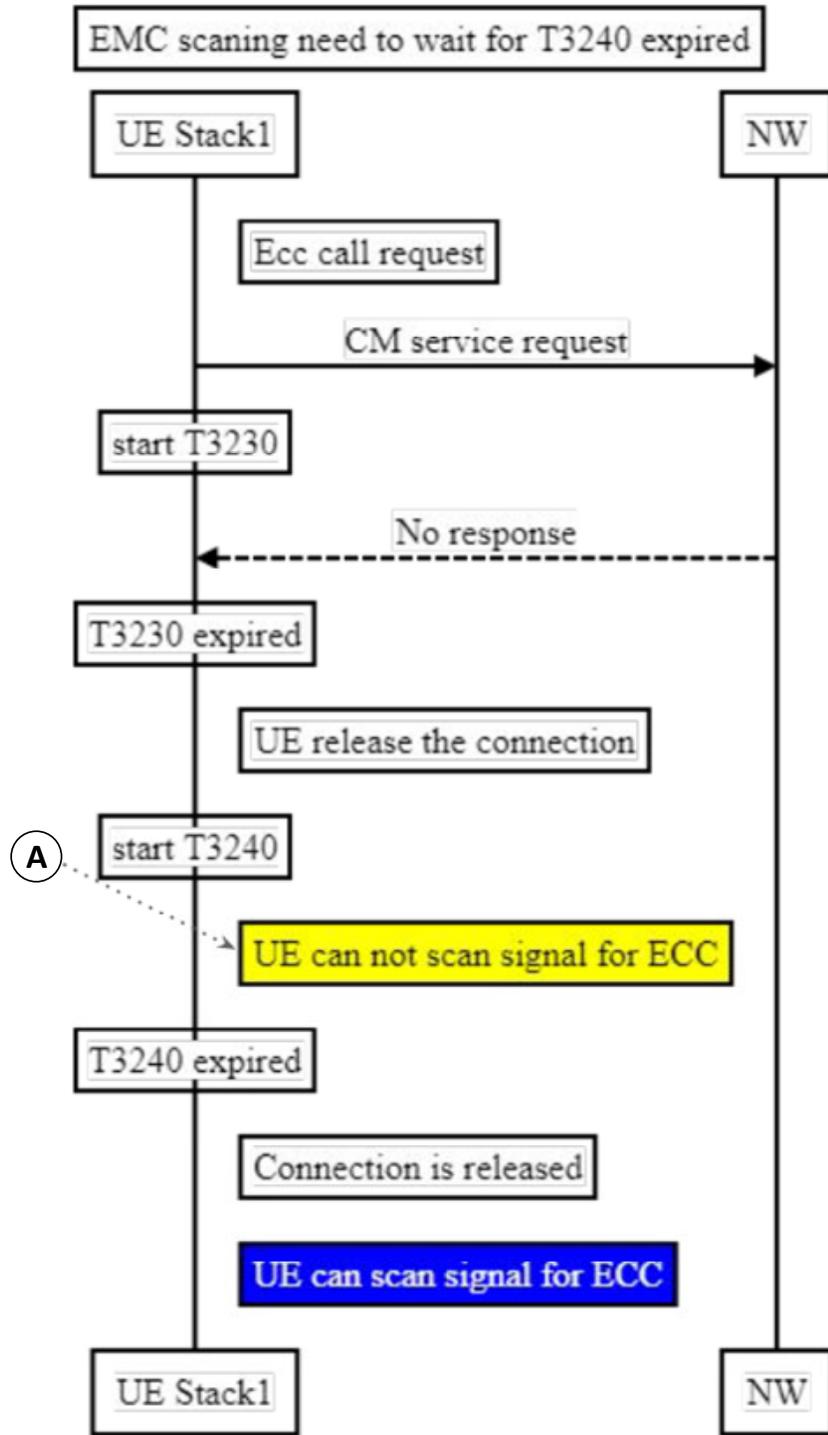
UE Stack1   NW

FIG. 1

Description

Modern cellular networks employ cellular protocols, such as Fourth Generation Long Term Evolution (4G LTE) and Fifth Generation New Radio (5G NR), that have evolved beyond the original scope of the 3G protocols. However, many mobile network operators configure UEs to fall back to using 3G RATs for conducting ECC calls due to the widespread coverage and range of 3G radio access networks (RANs). However, as noted above, the reliance on the use of the T3420 timer in 3G call establishment can significantly delay a network connection for an ECC call. Accordingly, described herein is a technique for establishing an ECC call that leverages the modern UE's ability to rely on multiple RATs or multiple networks through multiple subscriber identities as typically reflected by the implementation of multiple subscriber identity modules (SIMs), either as physical SIMs (pSIMs) or virtual/electronic SIMs (eSIMs). This technique is illustrated by the flow chart of FIG. 2 below.

The method of FIG. 2 picks up with the expiration of timer T3230 after initiating an ECC call by sending a CM service request from the UE to the network as shown in FIG. 1 above. As with the conventional approach, the UE releases the connection and starts the T3240 timer. However, unlike the conventional approach in which a UE would then sit idle until the T3240 timer expires, the UE instead can utilize its additional cellular resources to attempt to establish a connection via an alternative route while the timer T3240 is counting down. This can be accomplished either by (1) using the same RAT employed for initiating the ECC call but with a different network via a second SIM of the UE, or by (2) using the same SIM but using a different RAT. The preference between option (1) or option (2), or the priority between using the options in sequence, may be set by a provider of the UE, by a user of the UE, or by some other mechanism.
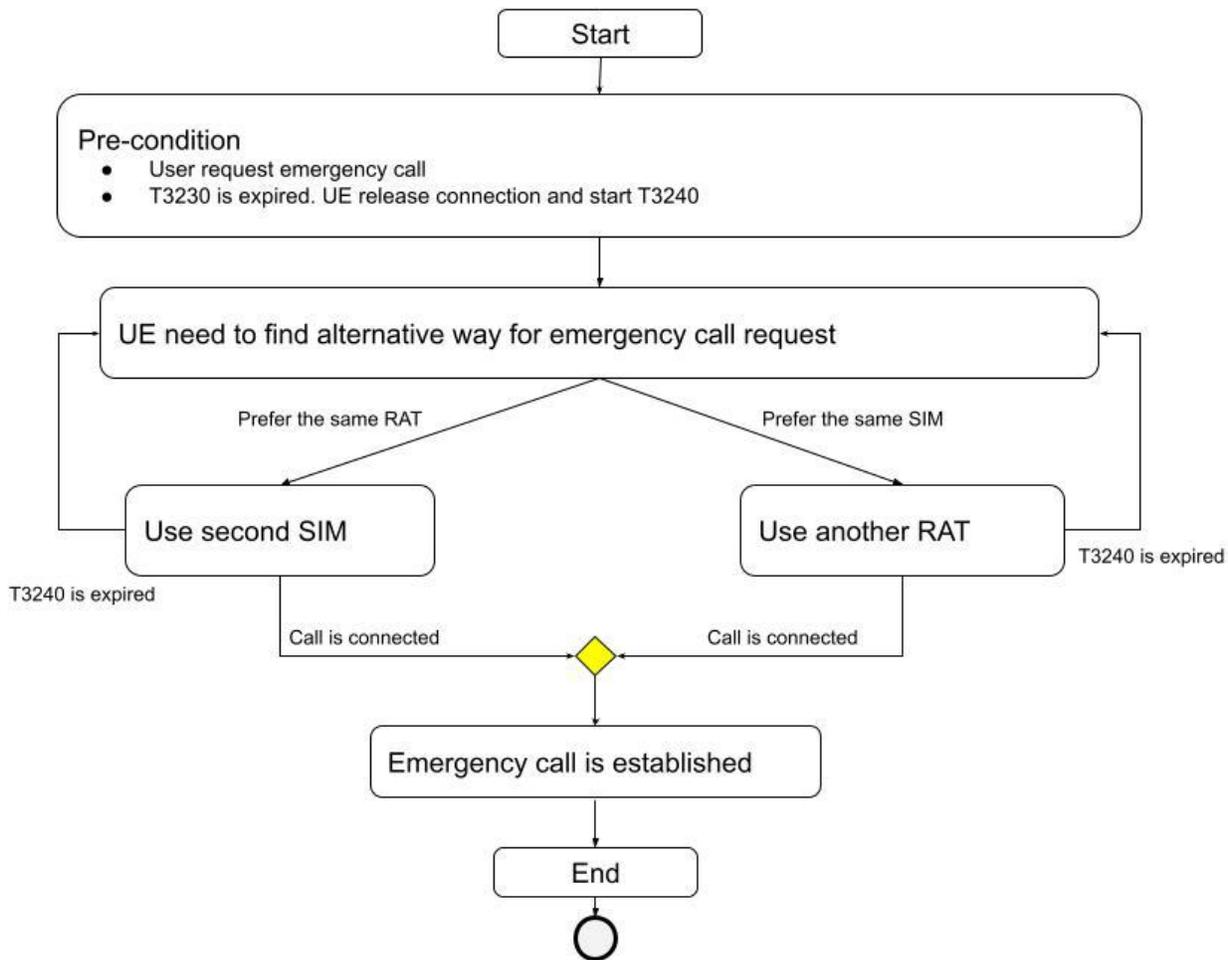
FIG. 2

For option (1) (use of the same RAT but a different subscriber identity), the UE attempts to connect to a different network (e.g., different public land mobile network (PLMN)) than the one originally attempted for the ECC call while using the same 3G RAT of the UE. Thus, assuming a 3G RAT was employed by the UE for the initial attempt to establish an ECC call with a first 3G RAN using the subscriber identity of a first SIM, once the T3240 timer is started, the UE can switch to the subscriber identity of a second SIM and attempt to connect to a 3G RAN of a different network provider associated with the second SIM while the T3240 timer is counting down.

For option (2) (use of a different RAT), the UE uses the same subscriber identity/SIM as used for the initial attempt to establish the ECC call, but switches to a different RAT while the T3240 timer is counting down. To illustrate, since presumably a 3G RAT is initially used for the emergency call, once the T3240 timer is started, the UE can switch to using a 4G LTE RAT or a 5G NR RAT to attempt to connect to a 4G LTE RAN or 5G NR RAN, respectively, of the same mobile network operator (MNO) using the same subscriber identity.

In the event that a call is established using the selected option, the UE can terminate the initial attempt and proceed with the alternative ECC call establishment. However, if the T3240 timer expires before a call is established, the UE then can attempt to use the other option. For example, if option (1) is attempted first, then the UE can switch to attempting option (2), or vice versa.

Using the technique described above, a UE can utilize the otherwise-idle period while waiting for the T3240 timer to expire to attempt to establish an ECC call using a different RAT or a different subscriber identity, and thus potentially eliminate up to 10 seconds of delay or idle time that otherwise could be incurred by following a conventional approach to timer management as dictated by the 3G protocols.

References

1. U.S. Patent Application Publication No. 2010/0297979, entitled "Method and Apparatus for Processing Emergency Calls" and filed on April 12, 2010, the entirety of which is incorporated by reference herein.

2. U.S. Patent Application Publication No. 2017/0034677, entitled "Reducing Call Failure Rate in Multi-Subscriber Identity Module Capable Devices" and filed on July 28, 2015, the entirety of which is incorporated by reference herein.

3. PCT Patent Application Publication No. WO2021022506A1, entitled "Multi Subscriber Identity Module User Equipment and Method for Operating Same" and filed on August 7, 2019, the entirety of which is incorporated by reference herein.