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March 2022

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Recommended Citation

Anonymous, "Transmitting Reliable Location Information via PIDF-LO in Emergency Calls", Technical Disclosure Commons, (March 30, 2022)

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Transmitting Reliable Location Information via PIDF-LO in Emergency Calls

ABSTRACT

Emergency calls have contrasting requirements of highly accurate positioning of the calling device and minimal impact to call setup time. It isn't always possible to send fresh location information that is also highly accurate, especially for a caller that is moving. This disclosure describes techniques to improve the accuracy of the location sent during an emergency call with minimal impact on the call setup time. Upon placing an emergency call, position fixes for the calling device are continuously obtained and pruned for recency and accuracy. Upon the expiration of a timer, the most recent position fix with greatest accuracy is sent to the emergency service provider.

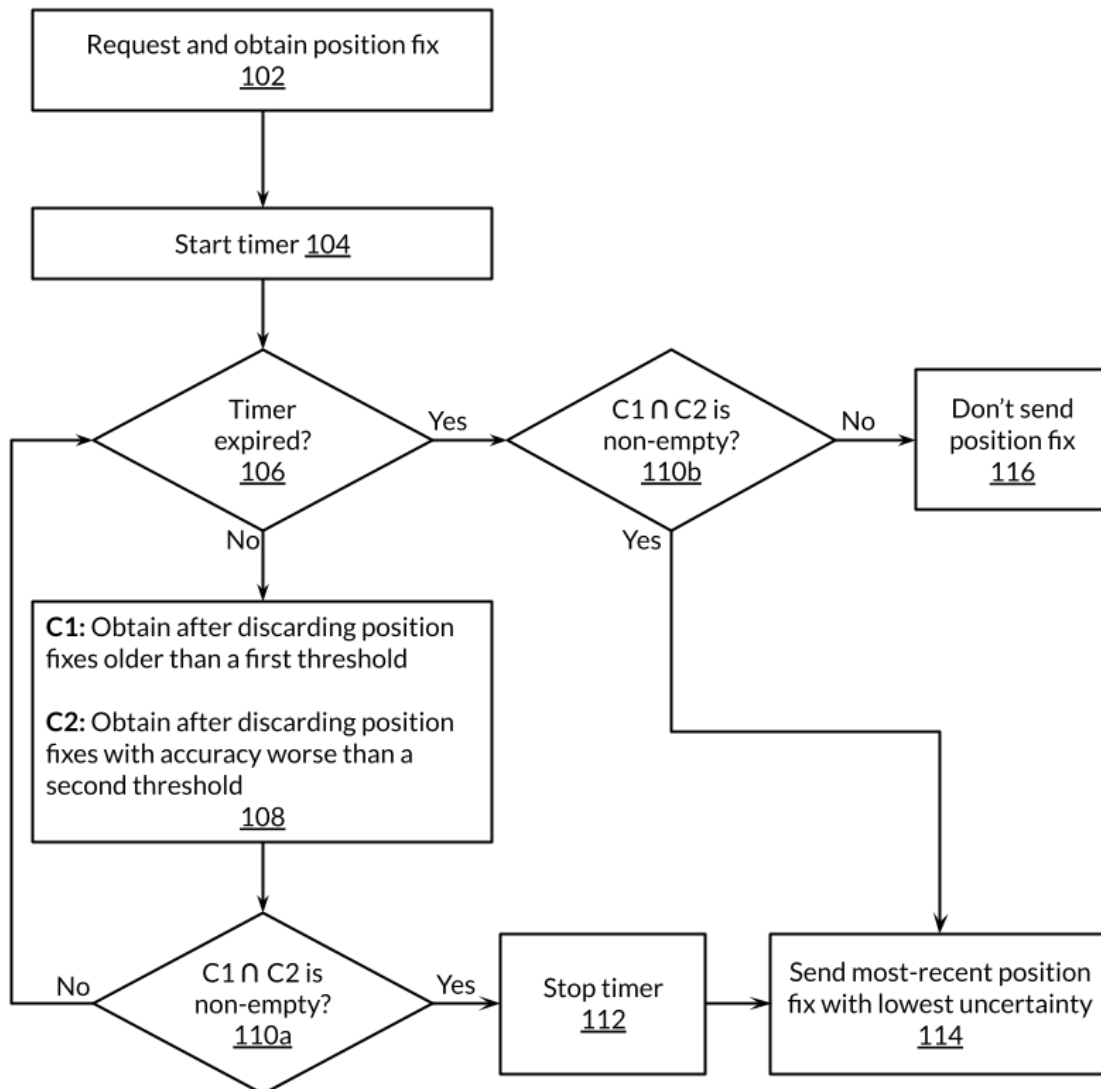
KEYWORDS

- Emergency call
- Enhanced 911 (E911)
- Presence Information Data Format Location Object (PIDF-LO)
- Session Initiation Protocol (SIP)
- Public Service Access Point (PSAP)
- Global Positioning System (GPS)
- Global Navigation Satellite System (GNSS)
- WiFi Positioning System (WPS)
- Device-Based Hybrid (DBH)
- Position fix
- Local Positioning System (LPS)
- Bluetooth beacon

BACKGROUND

PIDF-LO (presence information data format location object) is an HTTP, XML tag format that includes a location object. PIDF-LO enables the sending of location objects natively on an emergency (E911) call over the internet, enabling high speed, high accuracy provisioning even as a caller moves about a building or campus. PIDF-LO is carried in the SIP (session initiation protocol) invite message for emergency calls. Sending accurate location information to telecom carriers in the SIP invite message enables the carriers to route the call to the nearest or most appropriate PSAP (public service access point, a call center for emergency calls such as police, ambulance, fire brigades, etc.). With inaccurate SIP PIDF-LO location data, a substantial number of emergency calls are routed to the wrong PSAP.

Emergency calls have contrasting requirements of highly accurate positioning of the calling device and minimal impact to call setup time. Accurate location of the caller is vital information to enable emergency responders to reach the caller. It isn't always possible to send fresh location information that is also highly accurate, especially for a caller that is moving.

DESCRIPTION**Fig. 1: Transmitting reliable location information via PIDF-LO in emergency calls**

This disclosure describes techniques to improve the accuracy of the caller's location sent during an emergency call with minimal impact on call setup time. As illustrated in Fig. 1, the user equipment, e.g., smartphone or any other device with a cellular modem, requests and acquires its position (102). Typically, position is acquired periodically, including at the time of placing an emergency call. Position can be acquired using, e.g., GNSS, GPS, WPS, LPS, Bluetooth beacons, or a combination (device-based hybrid) of positioning technologies.

A timer is started (104). While the timer is unexpired (106), a set of recent, accurate position fixes is obtained (108). Position fixes are continuously acquired along with their timestamps and accuracy. A set C1 of position fixes is obtained by discarding position fixes older than a first threshold. A set C2 of position fixes is obtained by discarding position fixes with accuracy worse than a second threshold. The intersection of the sets C1 and C2 represents recent, accurate position fixes, e.g., those that are younger than the first threshold (recent) and more accurate than the second threshold (sufficiently accurate). If the intersection of sets C1 and C2 is non-empty (110a), the timer is stopped (112) and the most recent position fix with the lowest uncertainty is sent in the SIP invite message (114).

If the timer expires and the intersection of sets C1 and C2 is found to be empty (110b) then no position fix was found that is both recent and accurate. Accordingly, location is not included in the SIP invite message (116).

The described techniques reduce the false-positive rate of sending inaccurate location using the PIDF-LO of the SIP invite message, while only minimally impacting call setup time.

CONCLUSION

Emergency calls have contrasting requirements of highly accurate positioning of the calling device and minimal impact to call setup time. It isn't always possible to send fresh location information that is also highly accurate, especially for a caller that is moving. This disclosure describes techniques to improve the accuracy of the location sent during an emergency call with minimal impact on the call setup time. Upon placing an emergency call, position fixes for the calling device are continuously obtained and pruned for recency and accuracy. Upon the expiration of a timer, the most recent position fix with greatest accuracy is sent to the emergency service provider.