

Persistent Systems' response to Consultation Paper on "Universal Single Number Based Integrated Emergency Communication and Response System"

4.1 What are the types of emergency services that should be made available through single emergency number?

Persistent Systems' Response:

Police, Fire and Ambulance services should be made available through a single number. A public awareness campaign should train the public to only use this number for time critical emergencies where intervention is required immediately (e.g. physical/sexual assault, fire, intoxicated driver, car accident with injuries, snake bite, heart attack). Non-time critical violations (e.g. parking violations, noise complaints) should not be directed to this number, most developed countries have a secondary number that the public can use for reporting of less serious offenses.

4.2 What universal number (e.g. 100,108 etc.) should be assigned for the integrated emergency communication and response system in India?

Persistent Systems' Response:

Any single number can be used. The cost of public awareness campaigns may be reduced by leveraging 100 as this number is familiar to many Indians.

As mentioned in the paper, #100 has some existing telecom infra in place where all such calls are routed through central operator. It should be checked if setting up of integrated emergency response requires a different infrastructure setup. If yes and it is not required to disturb this existing setup for #100 then a new number would be more advisable.

4.3 Should there be primary / secondary access numbers defined for the integrated emergency communication and response system in India? If yes, what should these numbers be?

Persistent Systems' Response:

In the US, many large metro police departments encourage the use of secondary numbers (e.g. 311) for issues that are not time critical (e.g. noise complaints, tips on stolen property, non-violent drug offenses)

Apart from having secondary number for lesser emergency needs, during the transition period it may be required to continue with aliases for incumbent primary emergency numbers such as existing numbers (#102, 108 etc.). These numbers can be routed to the same integrated emergency communication system. Since these are already announced to public, immediately discontinuing these is not recommended. However, we recommend that after the primary number is well familiarized with the public, the aliases should be discontinued in phased manner.

4.4 For implementing single number based Integrated Emergency Communication and Response System in India, should the database with information of telephone users be maintained by the individual service providers or should there be a centralized database?

Persistent Systems' Response:

It is recommended that the government encourage a central database. In the US, which has a 40 year legacy of landline E911, there are over 250 databases maintained by individual local operators. Mobile operators have had to rely on a near monopolist to aggregate access to all of these databases, the result has been a very expensive solution. We encourage the DoT/TRAI to consider a single centralized DB maintained by a neutral party that all operators will help support financially.

Couple of factors might make it difficult to keep a centralized database such as huge daily updates due to high churn rate of subscribers etc. To address this regional database could be considered. However, it is still advised to have a neutral third party to manage a technical solution which can be made available to all the regional database owners. Central neutral entity can provide the right solution to regional databases making its management simple for regional database authorities. It can in turn bring standardization in the solution and reduce time to launch aspect. Further, neutral entity may provide required connectivity to all the regional databases so that for any service provider/PSAP only connectivity to central entity is sufficient to reach out to all databases.

4.5 In case of centralized database which agency (one of the designated telecom service provider, a Central Government department or a designated third party) should be responsible for maintaining the database?

Persistent Systems' Response:

Either case is acceptable, though in the case of a designated telecom service provider the government should ensure that the database is supplied marginally above cost. The designated operator for the database, which will be critical infrastructure for the entire nation, must not be allowed to exercise monopolist pricing.

4.6 What are the technical issues involved in transfer of location of a mobile user in real time?

Persistent Systems' Response:

There are no particular challenges to obtain refined position from mobile devices in near real-time (approx. 5 seconds for cell trilateration, up to 20 seconds for "RF Fingerprinting"). Both CDMA and GSM/3GPP have specified standards based network elements (e.g. CDMA: MPC/PDE, GSM/UMTS/LTE: GMLC, SMLC). These standards based network elements can obtain the requisite network and device measurements, even for non-data enabled devices, necessary to calculate position.

In terms of delivering the position following needs to be considered -

As currently seen in the 911 system of US, it is not possible to send initial location along with the cellular 911 call trigger to the PSAP. The existing trunk lines cannot support sending more than 10 or 20 digits of information. The solution followed is to send a unique 10 digit key ESRK (Emergency Services Routing Key) using which the final call routing happens to appropriate PSAPs by selective routers. An ESRK identifies an emergency call at MPC and is a unique identifier of a PSAP. Each PSAP is assigned an ESRK range. MPC selects from this range based on to which PSAP call is to be routed. PSAPs need to request initial and updated location using ESRK through a special emergency infrastructure known as ALI systems. These ALI systems need to be designed out of the telecommunication infrastructure.

The above issues might also be applicable to India considering that the telecommunication infrastructure would be on similar lines as in US.

4.7 What accuracy should be mandated for the location information to be provided by the mobile service provider?

Persistent Systems' Response:

We propose the following accuracy requirements:

- 1) Satellite based positioning: If and only if the device is equipped with GPS the mobile operator must attempt to calculate A-GPS position using standards based protocols over "control plane" (i.e. CDMA 801-1, GSM/UMTS: RRLP, LTE: LPP). As GPS often fails indoors there must be automatic "fall back" to network based positioning.
- 2) Network based positioning methods: Operators shall meet the following accuracy requirements on a per PSAP region basis:

Radio Technology	Suggested Required Accuracy	Suggested Methods (any method that meets requirement is acceptable)
GSM/UMTS	Urban: Better than 200 meters 67% of time, 400m 90% of time Rural: Better than 400 meters 67% of time, 600m 90% of the time	Rural- GSM NMR+TA, UMTS Cell+RTT Urban: AE-CID/RF Fingerprinting against propagation model predicted DB U-TDOA
CDMA	Urban: Better than 100m 67% of time, 300m 90% Rural: Better than 200m 67% of time, 400m 90%	AFLT
LTE	Urban: better than 75m 67% of time, 300m 90% Rural: better than 200m 67% of time, 400m 90%	OTDOA, AoA+Uplink Time Delay, U-TDOA

Though we are suggesting the location accuracy needs for IECRS, we believe that these cannot be discussed in isolation with the LBS accuracy mandate for lawful intercept from DoT published as "Unified Access Service Amendment Letter No. 10-15/2011-AS.III/ (21) dated 31st May 2011". From an operator's point of view it may be cost effective for them to deploy a single location system for both IECRS as well as lawful intercept requirements.

We believe that it is difficult for positioning technology vendors to deliver, within acceptable cost limits as seen by operators, the accuracy stipulated by DoT in the May 2011 amendment for GSM/UMTS networks using

“server only” technologies widely described as “RF Fingerprinting” or Advanced E-CID (AE-CID) without site surveys so extensive as to become economically impractical. These technologies only deliver stipulated high accuracy in areas where extensive field data collection/site surveys have been performed and have significantly lower results when using propagation models to populate fingerprint databases. Phase II of the DoT mandate requires better than 100m 75% of the time (better than 300m 95% of time). In comparison the US FCC e911 Phase II requirement only required 100m 67% of the time (300m 90% of time). US Tier 1 GSM/UMTS mobile operators failed to meet the e911 Phase II requirement using RF Fingerprinting & AE-CID and ended up deploying a technology called U-TDOA that required the deployment of “Location Measurement Units (LMU)” cell towers costing over one hundred million dollars (\$USD) for a nationwide deployment. Due to the unacceptable accuracy associated with RF Fingerprinting/AE-CID the US FCC only granted use of RF Fingerprinting/AE-CID as an exception outside of the key population centers. While U-TDOA is the “gold-standard” network positioning technique it does require the expense of deploying LMUs at tower sites. Considering the above aspects associated with positioning methods RF fingerprinting/AE-CID or U-TDOA, we suggest that:

- a) The government should fully subsidize this for GSM/UMTS operators through tax refunds
- b) Or, the requirements from the May 2011 CDR tagging memo should be relaxed or restated for GSM/UMTS following the Canadian CRTC 911 model such that “server only” technologies like AE-CID/RF Fingerprinting can meet accuracy requirements in real-world scenarios using databases filled with fingerprint predictions from propagation models (i.e. rather than DBs constructed from site surveys). More ambitious accuracy goals can be stipulated for CDMA and LTE networks as these technologies are synchronous on the “down link” making it possible to implement “server only” methods (e.g. CDMA AFLT, LTE OTDOA) that have been empirically proven to deliver 100m 67% of time in urban/suburban areas where mobile devices are typically in “soft handoff” with at least 3 towers.

Technology companies like Persistent can be involved to conduct a field trial with DoT and designated CDMA, GSM/UMTS, LTE mobile operators to evaluate various positioning methods for performance (i.e. accuracy/response time, with/without site surveys) in rural and urban environments. This can be the basis of policy that has KPIs that have been verified to be achievable in the real world and assuages the concerns of mobile operators.

4.8 Should emergency number access be allowed from inactive SIMs or handsets without SIMs? Please justify your answer. Should emergency access be allowed through SMS or email or data based calls? If yes, what will be the challenges in its implementation?

Persistent Systems’ Response:

We believe that the ability to serve devices without SIMs (or valid/charged SIMs) is something that the government should require to provide assistance to the most vulnerable sections of society (e.g. bottom 20% of income, bonded laborers, trafficked women and children. There are no issues with this as this capability is proven and has already been deployed in the US. This capability can be implemented on Mobile Switches and HLR/HSS that are already commercially available.

Other than voice, SMS should be the second in priority that should be considered for emergency services enablement as compared to any other technology (email etc.).

4.10 Is it technically possible to get Location information in case of SMS or data based calls on real time basis? If yes, please elaborate the process and technical challenges if any.

Persistent Systems’ Response:

Yes, it is technically possible. In the US this is part of NENA Next Generation/i3 specification to be deployed in the next few years. In the US this involves major upgrades to the existing PSAP side equipment. But in India where there is little installed base, PSAPs can install NENA i3 compliant solutions at the start. On the operator side, no changes will be required to the positioning layer but the following new capabilities must be deployed:

1. SMSC need to have the required interconnectivity with emergency trigger processing infrastructure like MPC/GMLC. SMSC need to redirect the emergency numbers to these entities.
2. SMSC should support prioritization of emergency SMS over normal SMS.
3. In response SMS, the phone should not beep to create any noise as it could be dangerous for the person in emergency (kidnapping case etc.). Operators/devices need to support these mechanisms.

4.11 How to build redundancy in operations of Centralized response centers or PSAPs as they may be vulnerable to attack – both Physical and Application software related (Virus, Malware, denial of service, hacking) or to Network failures or Congestion i.e. Call Overload?

Persistent Systems' Response:

No Comments.

4.12 Should all the calls made to universal emergency number be prioritized over normal calls? Please justify your answer.

Persistent Systems' Response:

Yes, emergency calls should have priority in obtaining MSC and PSTN switch circuits. Furthermore, if the DoT allows for operator location infrastructure (i.e. GMLC/MPC, PDE/SMLC) to serve both LBS and emergency service associated location requests, emergency location requests must be given priority over LBS.

4.13 What legal/penal provisions should be made to deal with the problem of Hoax or fake calls to emergency numbers?

Persistent Systems' Response:

No comments.

4.14 How should the funding requirement be met for costs involved in implementation of IECRS? Should the cost be entirely borne by Central/State Governments or are there other possible ways to meet the funding requirements?

Persistent Systems' Response:

IECRS will require the deployment of solutions by both mobile operators and local emergency service providers (i.e. PSAP). We recommend that the central government provide tax rebates to mobile operators to fully cover their investments in solutions necessary to provide IECRS call routing and mobile location accuracy compliance.

We recommend that PSAP premise solutions (i.e. SW, HW, connectivity) should be selected and funded by the central government to accelerate the rollout of IECRS in each state. Staffing of PSAP call centers should be funded by state governments.

The central/state governments can recover costs by:

- Levying a \$1/SIM year charge to operators that they can pass along to consumers in higher per minute/text fees. It should be noted that mobile subscribers of all income groups are spending more or less similar amounts for personalized ring tones/SMS jokes and such other creative value added services.
- IECRS surcharges on new vehicle purchases. Consider that auto accidents will be a major source of incoming IECRS calls
- Surcharges on fines for traffic violations (again, illegal/unsafe driving results in a large % of emergency calls)

4.15 Should Key Performance Indicators (KPIs) related to response time be mandated for PSAPs? If yes, what should be the KPIs? Please justify your suggestions.

Persistent Systems' Response:

Different KPIs should be maintained for both mobile operators and PSAPs. PSAPs should be graded on quantitative and qualitative assessment:

- Qualitative KPI: Calls & SMS transcripts must be recorded for forensic review and qualitative grading for quality
- Quantitative measures:
 - Call arrival rate per time of day (not a KPI but should be collected for planning staffing)
 - Average call duration (not a KPI but should be measured for planning purposes)
 - KPI: Average caller hold time per time of day (reflects whether PSAP is adequately staffed)
 - There should be some KPI for PSAPs to provide time bound response once they receive emergency trigger. The whole emergency system will not be successful if there is no such mandate or service quality ensured from the PSAPs.
- Operator "cross check" by PSAP: While the mobile operators are responsible for these KPIs, PSAPs should measure and report the following to the DoT to cross check against mobile operator reported accuracy:
 - Location Response time: What is the average elapsed time between PSAP location request and mobile operator location response
 - Location accuracy: Does the mobile operator meet the DoT mandated accuracy within the PSAP's region of service.

4.16 Should use of language translation services be mandated for PSAPs?

Persistent Systems' Response:

This is highly recommended as there is a great deal of internal migration. However this should not be a launch requirement for IECRS

4.17 In your opinion, what issues related to interconnectivity and IUC may come up in implementation of IECRS in India? What are the suggested approaches to deal with them?

Persistent Systems' Response:

Systems similar to ALI systems, described above might be needed to deliver the location information.

To address such issues, IP based infrastructure systems should be considered where the calls and location information can be delivered over IP network. This is similar to the i3 proposal from the NENA organization in US.

4.18 Should a separate emergency number for differently able persons be mandated in India? How the use of this number be administered?

Persistent Systems' Response:

Supporting a separate number would help in an initial expectation setting of PSAPs about the capabilities of the caller. However, it can be considered as an enhancement later if it turns out after experience that single number reduces the effectiveness of the service that can be provided to such people.

4.19 In your opinion, apart from the issues discussed in this consultation paper, are there any other technical, commercial or regulatory issues that may be involved in implementing

Persistent Systems' Response:

The public will not differentiate between the quality of IECRS and the service delivered by responding emergency services personnel. It is essential that the emergency staffs in the field are supplied with the communication tools to ensure there is continuity of service with the PSAP. Furthermore, in medical emergencies every minute counts. As in the US, municipalities should endeavor to staff the PSAP with at least one medical professional (e.g. EMT, nurse, physician) who can supply basic first aid instruction over the phone while the emergency field team is en route:

- Choking
- CPR
- Ingestion of chemicals by children
- Snake bite by species
- Lacerations/heavy bleeding

About Persistent Systems

Established in 1990, [Persistent Systems](http://www.persistent.com) (BSE & NSE: PERSISTENT) is a global company specializing in software product and technology services. For more than two decades, Persistent has been an innovation partner for the world's largest technology brands, leading enterprises and pioneering start-ups. With a global team of more than 6,000 employees, Persistent has 300 customers spread across North America, Europe, and Asia. Today, Persistent focuses on developing best-in-class solutions in four key next-generation technology areas: Cloud Computing, Mobility, Analytics and Collaboration, for telecommunications, life sciences, consumer packaged goods, banking & financial services and healthcare verticals. For more information, please visit: <http://www.persistent.com>.

Persistent Systems' Location Platform enables telecom operators to launch commercial location based services as well as comply with government security regulations like US E911. Persistent Systems' industry proven Location Platform has been successfully deployed across a number of Tier 1 telecom operators worldwide, catering to an array of network technologies covering CDMA, GSM, UMTS and LTE. Through its in-premise and hosted offerings, Persistent Systems provides cost effective solution to operators in all tiers. Read more: <http://www.persistent.com/PersistentIP/LocationBasedServices.aspx>

India

Persistent Systems Limited
Bhageerath, 402,
Senapati Bapat Road
Pune 411016.
Tel: +91 (20) 6703 0000
Fax: +91 (20) 6703 0009

USA

Persistent Systems, Inc.
2055 Laurelwood Road, Suite 210
Santa Clara, CA 95054
Tel:+1 (408) 216 7010
Fax:+1 (408) 451 9177
Email: info@persistent.com

