Telecom Regulatory Authority of India

Recommendations

On

Telecom network failures during Emergencies/Disasters –

Priority routing of calls of persons

engaged in 'response and recovery'

26th November, 2013

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Chapter I - REQUIREMENT OF PRIORITY CALL ROUTING

Introduction

1.1 Telecommunications have a significant social, cultural and economic impact on modern society. A number of research studies have shown the macroeconomic link between an efficient and robust telecommunication infrastructure and economic growth. Apart from the role in economic and social development, modern telecommunications infrastructure has also provided an effective support to deal with natural calamities and emergency situations and help in restoring order and disrupted social and economic activities. The role of telecommunication is crucial in 'response and recovery' during emergency situations.

1.2 The constitution of International Telecommunication Union(ITU) emphasizes the role of telecommunications during times of emergency. It states that ITU shall "promote the adoption of measures for ensuring the safety of life through the cooperation of telecommunication services". The importance of emergency telecommunication figures across all three verticals of ITU :

- ITU-R (Radiocommunication) : ITU-R facilitates the prediction, detection, and alerting through the coordinated and effective use of the radio-frequency spectrum and the establishment of radio standards and guidelines concerning the usage of radio communications systems
- ITU-T (Standardization) : ITU-T plays a strategic role in ensuring global interconnection and interoperability of telecommunications networks for monitoring and management at the onset and during emergency and disaster situations, and
- ITU-D (Development): ITU-D has directed its effort at mainstreaming disaster management in telecommunications/

ICT(Information and Communication Technology) projects and activities as part of disaster preparedness. This includes infrastructure development and establishment of enabling policy, legal and regulatory frameworks. In the immediate aftermath of disasters, ITU-D deploys temporary telecommunications/ICT solutions to assist countries affected by disaster.

1.3 The National Telecom Policy-2012 (NTP-2012) also recognizes the need for harnessing telecom networks to provide support in disaster situations :

Para 15 of Preamble - NTP-2012 recognizes the importance of creation of robust and resilient telecom networks for adequately addressing the need for proactive support for mitigating disasters, natural and manmade.

Para 5.12 of Strategies - To prescribe sectoral Standard Operating Procedures for effective and early mitigation during disasters and emergencies.

Para 5.13 of Strategies - To create appropriate regulatory framework for provision of reliable means of public communication by Telecom Service Providers during disasters.

These provisions of the telecom policy are clearly in sync with India's needs. Hardly a year goes by where some part of the country does not suffer natural disasters like floods, earth-quakes, coastal cyclones etc on the one hand and manmade disasters such as accidents, terrorist attacks etc on the other. Instituting a framework and defining various processes to ensure reliable means of communications during disasters/emergencies in India can help in better response and recovery.

1.4 Under section 11(1)(a) (iv) of TRAI Act 1997 (as amended), Telecom Regulatory Authority of India (TRAI) is entrusted with responsibility of promoting efficiency in the operations of telecommunication services so as to facilitate growth in such services. Further, under section 11(1)(a)

(vii) of TRAI Act 1997 (as amended), TRAI can make recommendations on any matter related to telecommunication industry in general.

1.5 An emergency is a situation which requires an urgent response. An emergency situation might transform into a disaster[1], either due to its nature, or as a result of insufficient response to the initial event. The breakdown of crucial communications is one of the most widely experienced characteristics in all disasters. Depending on the situation, the quality of the preliminary response to disasters can be vastly improved by interventions/resources that require the use of telecommunication for easy and effective mobilization.

1.6 During any disaster, inter-organizational communication amongst official emergency responders is usually dependent on civilian communication networks rather than networks maintained by some government organizations like the police or para military organizations. This is primarily because (a) wider availability of civilian communications networks; (b) widespread standardization and therefore compatibility with other networks; and(c) advanced capabilities of Civilian network due to their regular upgradation.

1.7 However, the telecom networks are themselves vulnerable to failure because of physical damage during a disaster. Despite the increasing resilience of modern telecommunications networks, the risk associated with communication failures remains serious. Even in the most developed economies, calamitous events have on occasion overwhelmed the telecommunications network.

[1] As per the *Disaster Management Act, 2005*, "disaster" means a catastrophe, mishap, calamity or grave occurrence in any area, arising from natural or manmade causes, or by accident or negligence which results in substantial loss of life or human suffering or damage to, and destruction of, property, or damage to, or degradation of, environment, and is of such a nature or magnitude as to be beyond the coping capacity of the community of the affected area. [http://ndma.gov.in/ndma/pdf/DM_Act2005.pdf]

Reasons for telecommunications failures during disasters

1.8 During disasters, telecom infrastructure failures occur because of various reasons. Disaster can impact the telecom infrastructure because of collapse of buildings, disruption in power supply, fire, telephone exchanges/switches getting overloaded, damage to communication towers etc. There are two broad categories of communication system failure during a crisis[2]:

i. **Loss of infrastructure** - Loss of infrastructure occurs when some or all elements of a telecom network are lost due to damage or other impacts (e.g. power blackouts), resulting in total loss of access to network. The loss, in turn, can result from the physical destruction of network infrastructure or disruption in supporting network infrastructure like electrical distribution systems, cooling systems, transport networks etc. Outages caused by disruptions in supporting infrastructure are less common than outages caused by physical damage but they tend to be far more widespread and damaging to response and recovery efforts.

ii. **Overload / Network congestion –** Major disasters are immediately followed by an intense burst in telecom traffic which can congest networks resulting in call-blockages and lost-messages. Most networks are engineered for peak load at levels well beneath the demands placed on them during disasters because of the cost factors involved.

1.9 There can also be a combination of loss of telecom infrastructure and network congestion. The loss of infrastructure mostly results in network

[2] Anthony M. Townsend and Mitchell L. Moss, April 2005. *Telecommunications infrastructure in disasters : Preparing Cities for Crisis Communications*

congestion. Sometimes even the congestion in networks can lead to failure of network elements.

Failure of telecommunication and various phases of disaster

1.10 A research study, funded by the National Science Foundation (NSF), was taken up in USA on "Reconstruction Following Disaster" which analysed the role of telecom networks in disaster recovery.[3] Based on the study of disasters in different regions and historical settings, four phases in chronology of disaster recovery were proposed:

a) Emergency responses
b) Restoration and repair
c) Reconstruction of the destroyed infrastructure for functional replacement
d) Reconstruction for redevelopment

1.11 A similar phased approach for disasters is also documented by National Disaster Management Authority (NDMA) in India. According to NDMA, a typical Disaster Management continuum comprises of six elements viz. Prevention, Mitigation and Preparedness in pre-disaster phase, and Response, Rehabilitation and Reconstruction in post-disaster phase defines the complete approach to Disaster Management[4].

1.12 Emergency response activities are taken up immediately after the disaster has struck. It is the emergency response that is the most crucial of all the four phases of disaster response (listed above), as it is during this period that the maximum impact of a response by way of saving human lives can be achieved.

[3] J Eugene Haas et al., eds. 1977. *Reconstruction Following Disaster.* (Cambridge, Massachusetts: MIT Press). Relevant chapter available at http://www.rwkates.org/pdfs/b1977.01_CH1.pdf

[4] http://ndma.gov.in/ndma/approachdm.html

1.13 There are government-owned public-safety communication systems (like police wireless) that provide skilled emergency responders with the capacity to coordinate life-saving and containment activities during disasters. Public safety networks are engineered to provide basic voice communications to support intra-organizational communications during disasters but even these networks are prone to failure in extreme circumstances. Moreover, for inter-agency emergency communications, civil networks are the only readily available communication channels. Because of the pace of innovation and investment that has occurred since the mid-1990s, the capabilities of civil telecommunications networks match or exceed those of government-administered wireless communications systems.

1.14 In major disasters that involve response from multiple government agencies and multiple jurisdictions, the public switched telephone network - both wired and wireless - has become the primary medium for emergency communications. This is because public safety organizations use a wide variety of radio equipments and this creates inter-operating problems viz. equipment used by one agency is incompatible with that used by another. This prevents communications amongst the various agencies. In addition, civil networks often provide greater capability for data communications than their public safety counterparts. Furthermore, non-governmental organizations and private agencies bear much of the burden of disaster relief, and since they do not have access to the public safety networks, they need to rely on the civil telecom networks for coordinating efforts.

1.15 Hence, once a disaster has struck and emergency response begins, the civil telecom networks play a critical role. In the emergency response phase of the disaster, the focus of official response is on preventing loss of life and, if possible, damage to property. Since lives are at risk, it is

also in this phase where the consequences of the failure of communications are the greatest. It is this crucial emergency-response phase of disaster management during which the integrity of communications is at greatest risk; also, and it is this phase that is most likely to witness and be affected by network congestion.

1.16 There are numerous international instances where congestion in the network affected the responders' communication after the disaster viz. Northridge earthquake of 1994[5], World Trade Centre incident of September 11, 2001[6], Tsunami of 2004 in Phuket, Thailand[7].

1.17 In India, immediately after the bomb blasts in some places like Mumbai, Ahmedabad and Bangalore, and the earthquake in Sikkim, congestion in mobile networks was observed. TRAI collected data from various Telecom Service Providers (TSPs) on these occasions. It was observed that the number of call attempts made just after the blasts were abnormally higher than the normal day call attempts resulting in exchanges going in to overload conditions. The volume of traffic carried by the networks after the bomb blast was around 30% more than normal day traffic volumes. Failure of the supporting infrastructure and congestion in the mobile networks was also observed during the Sikkim earthquake on 18th September 2011 which affected parts of Bihar, Jharkhand and West Bengal. From an analysis of reports from these regions it was observed that:

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[5] A Faiola and T Reed. January 18, 1994. "*L.A. communications in Chaos*". Miami Herald.

[6] According to carriers' reports to the FCC, there was a ten-fold increase in call volumes during peak hours just after the attacks, led to a 92 percent block rate on New York City's cellular phone networks. In Washington, the blocked call ratio was less severe, but still unacceptable - National Research Council. Computer Science and Telecommunications Board. 2003. *The Internet Under Crisis Conditions: Learning From September 11*. [http://www.nap.edu/openbook.php?record_id=10569&page=R1]

[7] After the 2004, cell phone networks (as well as landlines) were congested, leaving only SMS operational - K Karnjanatawe. February 23, 2005. *"Role of ICT in disaster examined"*. Bangkok Post.

- The call attempts of various operators increased between 1.2 to 3 times between 18-22 hrs of 18th September, 2011 and, accordingly, the impact on Call Completion Rate (CCR) was substantial.
- The report on Quality of Service (QoS) parameters clearly showed increased BTS unavailability as some BTS sites were affected because of power unavailability and inaccessibility to the sites.

1.18 These experiences corroborate that disasters/emergencies trigger a tremendous rise in telecom traffic, particularly in wireless networks, which can cripple telephone services of an entire region. Congestion in networks during the response phase of emergency situations can paralyze official responses, challenge containment, and delay mobilization of broader relief efforts.

1.19 As the role of the personnel involved in the rescue and relief operations is very critical during emergencies they need to be able to communicate. This, in turn, necessitates their being given priority on a communications network over other persons, especially because congestion is a reality in such conditions. Therefore, a system needs to be devised to facilitate such a mechanism which gives priority to these personnel on communication networks during emergencies.

1.20 **Accordingly, the Authority recommends that a priority call routing scheme should be instituted to ensure that calls of personnel responsible for 'response and recovery' during disasters are routed on priority**.

1.21 In its Consultation Paper (CP) titled 'Telecom Network Failures during Emergencies/Disasters –Priority routing of calls of persons engaged in 'Response and Recovery' dated 10th May,2012, the Authority had discussed various possible technical solutions to the problem of network congestion during emergency situations along with their pros and cons.

Based on the discussions, stakeholders' comments were invited on various issues that would be involved in putting in place a mechanism for priority routing of calls of persons engaged in 'Response and Recovery'. Subsequently, TRAI had held an Open House Discussion (OHD) on 10th October 2012 in which it was suggested by industry that a seminar be held to discuss the technical issues involved in implementation of the priority call routing system. Accordingly, a seminar was held on 21st November, 2012 in which COAI, BSNL and AUSPI participated under the aegis of TRAI to discuss the technical issues involved in implementation of priority call routing in India. Various techno-commercial and regulatory issues involved in implementing Priority Call Routing (PCR) in India and the views of the Authority on them are discussed in succeeding chapters.

1.22 Chapter-II discusses the various technical models and issues involved and the model that can be implemented in India for PCR. Chapter-III discusses the identification of organisations and personnel eligible for PCR. Chapter-IV provides a summary of the recommendations.

CHAPTER II: TECHNICAL MODEL TO BE IMPLEMENTED IN INDIA FOR PRIORITY CALL ROUTING AND ISSUES INVOLVED

Dimensioning of Network

2.1 During emergency situations congestion has been observed on telecom networks as traffic volume increases considerably. One of the obvious solutions is to dimension the core network of the Telecom Service Providers (TSPs) for extra capacity to handle the increased volume of traffic. The Authority invited comments of stakeholders' on whether there should be a direction from TRAI on network dimensioning, both for operating in normal as well as in emergency situations.

2.2 In their response, most TSPs suggested that there should not be any direction from the Regulator or the Licensor on network dimensioning both for operating in normal as well as in emergency situations. Their contention was that dimensioning of the network should be left to the operators; the only requirement that can be mandated in this regard should be that the networks are designed with sufficient capacity to fulfill the network Quality of Service (QoS) parameters as stipulated by TRAI. It was also pointed out by them that over-dimensioning of the network entails huge costs and this additional burden will obviously have adverse implications on tariffs, network expansion, upgradation etc.

2.3 Some stakeholders added that TSPs plan redundant networks such as geo HLR, alternate media, etc. and provide toll-free access to emergency and disaster numbers as mandated by the Licensor. Operationally, network elements are already dimensioned with capacity headroom of 30% to 40% of the busiest hour traffic to take care of a sudden burst in traffic. Hence, there should not be any direction from the regulator on network dimensioning.

2.4 Currently, TSPs dimension their respective networks; there are no directions from TRAI on this subject. The guiding principle behind network dimensioning is that the TSP should be able to meet the required QoS parameters. Over dimensioning of the network has the benefit that it can take care of a spike in traffic. However, over-dimensioning of the network elements entails costs to the TSPs, who may have to pass on such additional costs to customers. In that event, customers will end-up paying extra for network capacity that would otherwise be lying idle for most of the time. Moreover, traffic volumes will vary based on the severity and location of the natural disaster or emergency and cannot be predicted. Therefore, a priori, it is not possible to correctly dimension the network to take care of all cases of emergencies.

2.5 The current system of giving the required flexibility to operators to dimension their networks so as to meet QoS benchmarks has helped them optimize the network cost vis-à-vis network performance. In view of this, the Authority is of the opinion that, for the present, there is no need to issue any direction in respect of dimensioning of networks for operating in normal/emergency situations.

Technical model to be implemented for Priority Call Routing (PCR)

2.6 A few developed countries like USA, UK and Canada have implemented priority routing of calls in their networks. Different technical and service delivery models have been implemented in these countries for PCR. Some of these are:

United States

a) Government Emergency Telecommunications Service (GETS): For landline phone users;

b) Wireless Priority Service (WPS): For wireless mobile phone users.

Canada

a) Priority Access for Dialing (PAD) program: for wired line users, and;

b) Wireless Priority Service (WPS) for wireless users (Similar to WPS in US)

UK

a) Access Overload Control (ACCOLC)

b) Mobile Telecommunications Privileged Access Scheme (MTPAS)

Details of these models may be seen in **Annexure-A**. A brief description of the models, along with their limitations, is discussed in the following paragraphs.

2.7 **Government Emergency Telecommunications Service (GETS)**

a) GETS has been implemented in USA to provide emergency access and priority processing in the local and long distance segments of the Public Switched Telephone Network (PSTN);

b) It uses access controls (separate access number and user verification through PIN), enhanced routing and priority treatment features;

c) GETS funding is through an annual budget to compensate carriers, systems integrators, and large switch manufacturers for the investments required to support GETS. In addition, there are user fees;

d) During the 9/11 tragedy, even with the communications infrastructure destruction, the success rate of GETS calls was 95% completion rate;

e) Limitations

- Limited only to wireline users

- Complicated access through PIN
- A user may not always keep the GETS card on his person and may not remember the PIN when needed.

2.8 **Wireless Priority Service (WPS)**

a) Overseen by the Federal Communications Commission (FCC) and administered by the National Communications System in the Department of Homeland Security in USA, WPS is a priority call routing system that is implemented for wireless networks;

b) An operator's participation in WPS is voluntary;

c) WPS works on Originating Radio Channel Priority, High Probability of Completion features and Terminating Radio Channel Priority;

d) Different priority levels defined for various types of eligible WPS users;

e) <u>Limitations</u>

- Does not preempt calls in progress
- Not yet supported by all carriers
- A mobile call that receives priority using WPS does not automatically get priority on landline networks

2.9 **Mobile Telecommunication Privileged Access Scheme (MTPAS)**

a) MTPAS is a system implemented in UK to restrict civilian access to cellular phone networks during emergencies, allowing priority for communications for emergency services personnel;

b) The cells adjacent to the places where the emergency has occurred are identified and MTPAS is implemented in those cells alone;

c) Initiated on direction from an authorized officer after deliberation with a coordinating group;

d) Access of telecom service to other users during the invocation of emergency is restricted. However, access to emergency services numbers (911, 112, 999) are allowed for civilians;

e) Other than usual and agreed contract costs, there is no additional cost attached to MTPAS;

f) Over-the-air (OTA) provisioning of MTPAS enabled SIM is possible;

g) Limitations

- In case of network overload, it denies access to civilians
- Not an 'always-on' facility and someone has to declare the invocation of the facility. Thus the initiation may take some time
- Due to congestion, the chain of commands required to initiate the service may itself not get communicated, making the entire facility non-workable
- Allows priority access of radio resources in area where implemented but does not ensure end-to-end priority in the network

2.10 In the CP, three possible models/approaches for priority call system were suggested. These models are briefly discussed below:

a) Model A - Combination of MTPAS of UK and GETS of US – In the MTPAS system, civilian usage of the network in certain areas (a cell or group of cell sites) is completely prohibited and communication is available only to entitled users via special SIMs. MTPAS system does not ensure priority in the backhaul network. On the other hand, the GETS system allows high priority calls to bypass the congested network and receive priority by dialing a universal code say XXXXX+ PIN+ destination

number without majorly affecting the services offered to other users. In view of this a solution which is a combination of MTPAS of UK and GETS of USA was suggested as a better approach for implementation in India. Such an implementation would have the combined advantages of GETS and MTPAS by ensuring priority in both backhaul networks as well as in radio-access resources.

b) **Model B - Solution based on MVNO concept -** In response to the pre-consultation paper, one of the stakeholders suggested a solution based on MVNO concept. In this solution :

   a. All mobile operators shall provide an Emergency Virtual Network Operator (EVNO) service similar to Mobile Virtual Network Operator (MVNO) that will be invoked only in emergency situations by a pre-determined chain of command.
   b. The virtual operator shall cater only to the Emergency Response Group as approved by a central committee.
   c. During regular (non-emergency) state, the virtual operator shall lie inactive.
   d. The capacity of this virtual operator shall be dynamic and a pre-decided percentage of network resources will be allotted for the Emergency-MVNO depending upon the severity of the emergency and its impact (Say level 1 to 5).
   e. Intra-Circle roaming across all Emergency-MVNOs may be allowed and enabled to ensure that all users of the Emergency-MVNO have access to any network as long as there is network coverage by at least one mobile operator.
   f. Network operators shall ensure that, during emergency/disaster situations, connectivity with Emergency-MVNOs gets priority in the backhaul and call termination. Inter-connectivity between various operators of GSM, CDMA, Landline and BWA should have priority access in emergency traffic.

g. Execution methods to invoke the virtual operator should be pre-decided and should take less than 10 minutes to activate the emergency network once instructed and authorised.

c) Model C - Solution based on Enhanced Multi-Level Precedence & Pre-emption" (as per 3GPP Technical Standard TS23.067) – Another model that was suggested by a stakeholder for providing priority call routing in Mobile networks during emergencies was through "Enhanced Multi-Level Precedence & Pre-emption(eMLPP)" which is detailed in 3GPP Technical Specifications(TS) 23.067[8]. The eMLPP service provides up to seven priority levels (A, B, 0, 1, 2, 3, 4) for call set-up and call continuity in the case of handover. eMLPP implementation provides a higher grade of service for urgent or emergency calls. It allows priority handling of calls, provision of priority information by the mobile user during call establishment, allows queuing in radio network based on the priority, pre-emption of radio resources and called party pre-emption by high priority calls. A pre-emption can result in disconnecting an ongoing low priority call in order to establish a call with higher priority.

2.11 Each of these models has its advantages and limitations. For example, to implement a combination of a GETS & MTPAS model or an eMLPP based model, network capabilities and technical feasibility of implementation need to be assessed across various networks in the country. Similarly, for the MVNO based model, the fact that MVNO is yet to be introduced in the Indian telecom market by the Government will need to be kept in view. Even if the MVNO concept is accepted for the limited purpose of introducing PCR during emergencies/disasters, for its implementation across various telecom operators, interoperability will remain an issue as this solution would not be based on technical

[8] http://www.3gpp.org/ftp/Specs/html-info/22067.htm

standards. Also, network security considerations would have to be appropriately addressed.

2.12 In response to the three models suggested in the CP, the pros and cons of these models pointed out by various stakeholders are summarized below –

a) Combination of MTPAS of UK and GETS of USA –

Views submitted in favour -

- It will be a suitable solution for India as it seems to overcome some of the challenges faced in standalone implementation of MTPAS and GETS.

Views submitted against -

- In the MTPAS system, civilian usage of the network in certain areas (cell or group of cell sites) is completely prohibited and communication is made available only to entitled users via special SIMs. Since mobile has become a primary mode of communication in India, this method has to be used with extreme caution as it would restrict network access to civilians.
- Implementing such a hybrid solution will need substantial CAPEX by the mobile operators and the Government. In view of the present poor financial health of cellular operators, this option should not be considered.

b) Solution based on eMLPP –

Views submitted in favour -

- This is the best suited solution for India as eMLPP is a solution based on 3GPP standards and it will be advantageous for operators to work towards it.

- In CDMA networks, a similar feature is available but it has a different nomenclature, namely, PACA (Priority Access and Channel Assignment).
- WPS solution (which is a variant of eMLPP) is already being used in USA for their CDMA networks. The priority subscriber configuration in HLR for routing calls on priority in CDMA MSC could be one of the approaches which is best suited for India.

Views submitted against -

- Cautious implementation is required as a pre-emption can result in disconnecting an ongoing low priority call in order to establish a call with higher priority
- Even though eMLPP technology is theoretically available in GSM and CDMA networks, the same has not been activated as of now for subscribers. Incremental CAPEX will be required for service to be deployed in a live network.

c) Solution based on MVNO concept

Views submitted in favour -

- A solution based on the MVNO concept is better as it will ensure communication for all priority users as long as there is at least one operator whose network is up.

Views submitted against -

- Implementation of this model will require critical and scarce resources to be allocated to the MVNO which would lie idle for most of the time, leading to non-optimal usage of these resources. There would be a cost associated with resources allocated to the MVNO operations. This will increase the cost of operations and may have an adverse impact on tariffs, network expansion and upgradation.

- The present licensing regime does not have a provision for any form of MVNO operations even if the MVNO is a wholly owned unit of an existing UAS Licensee.

2.13 A major issue pertains to whether PCR based on an eMLPP solution is possible in the TSPs' networks. In case it is not, what is the additional cost and time involved for its implementation?

The views expressed by various stakeholders are summarized below–

- eMLPP is a feature in GSM networks that supports pre-emption and allows assigning different levels of priority to different users. Priority access feature and pre-emption is technically possible in the inter-operator scenario as well, provided both the originating switch and the terminating switch support the feature by using special parameters (eMLPP precedence and Sub Cat) in ISUP (**IS**DN **U**ser **P**art) messages.
- The real challenge exists in activating PCR in CDMA networks operating with legacy switching systems as they need complete replacement with significant Capex investments. Some CDMA operators in India still have a number of legacy CDMA switches operational in the network. Apart from the replacement of legacy CDMA switching systems, some of the core platforms and networks such as HLR, NLD network, etc will also need feature upgrades with significant CAPEX requirements. Sizeable investments may be required to make all the network elements eMLPP ready. Telecom operators are not in a position to invest such amounts, given the various other financial / regulatory obligations that have to be met in immediate future.
- Inter-operator eMLPP or its equivalent is quite possible but it needs to be tested by carrying out feasibility studies with

technology partners as presently these features are not implemented in the service providers' networks.

- Time and cost for its implementation would depend on the scale at which the solution is to be implemented.

2.14 The Authority studied the various suggestions and the comments of the stakeholders in detail. It observed that though the concept of MVNO based priority system seems innovative, it has following critical implementation bottlenecks:

a) As disaster can take place anywhere in the country, therefore, Emergency-MVNO has to be created in all the service areas on all India basis and critical resources like numbering resources are required to be kept allocated to such MVNO. As disaster are mostly localized and are for short duration of time, such resources would lie idle for most of the time, leading to non-optimal usage of these resources.

b) Present licensing regime does not have provision for any form of MVNO operations even if the MVNO is a wholly contained unit of an existing UAS Licensee. Therefore, before the MVNO operation is contemplated, the licensing framework will need to be modified.

c) The suggested model is not based on any technical standards and hence its implementation across different networks will have technical challenges.

d) This model will require to be invoked after every emergency through a series of commands. Required network resources will have to be allocated to the Emergency-MVNO every time the feature is invoked.

e) All the subscribers of such MVNO will have to carry their MVNO SIM card all the time and have to shift to MVNO SIM once emergency situation is declared and MVNO- model is invoked.

f) During major disasters/emergencies, it may not be possible to contact the designated person of each telecom service provider for initiating the required chain of commands for invoking the Emergency-MVNO.

g) For invocation of Emergency-MVNO, major modifications would be required to be carried out in network elements. During disaster/emergency the network resources and processors would already be overloaded. Carrying out modifications in MSCs and related network elements for invocation of Emergency-MVNO at such a time may further aggravate the problem and can result in complete failure of the network. In fact, for the same reasons, any solution that requires to be invoked when the telecommunication networks are already constrained during emergency should not be preferred for PCR implementation.

h) The MVNO based solution only gives priority for allocation of radio and other resources to a subscriber within a particular TSP's network. A call placed beyond the TSP's network will not get any preferential treatment. For example, consider a situation when a emergency has occurred in Uttarakhand. Firstly the Emergency-MVNO has to be invoked in the networks of Uttarakhand so as to ensure that the emergency responders who have SIMs of this MVNO gets preferential resource allotment in networks of the TSP on which the MVNO is working. Now if such a responder wants to call a number of National Disaster Management Authority (NDMA) in New Delhi, his call will not get any preferential routing treatment beyond the network of Emergency-MVNO in Uttrakhand.

2.15 In view of the foregoing, the Authority has not considered the MVNO based approach for implementing priority routing of calls in Indian networks.

2.16 Another model that was discussed in the CP was implementation of priority routing through a combination of GETS and MTPAS models. The MTPAS system also requires a chain of command to be initiated for activating MTPAS features. Further, other consumers, except PCR users, will not get any access to network as long as the MTPAS service remains activated. This is a very serious limitation, as, at the time of emergency, citizens would also like to contact and communicate with their near & dear ones. Restricting the access of citizens to mobile networks in an emergency situation may only exacerbate difficulties and should be avoided. This may also make it difficult for decision makers to make up their minds about activating this feature as it will result restriction of access to citizens. It is likely that decision makers will avoid taking such a decision.

2.17 When a disaster strikes and networks get congested, there are chances that the communication to various telecom service providers to invoke the MTPAS system may not get through as it has to go through the same congested network and will not get priority till the system is invoked. In view of these limitations, even if implemented, such a system will have little practical utility as it would seldom be invoked, as has been the case in the United Kingdom. Moreover, the MTPAS system only ensures that the emergency responders get access to radio resources in BTSs located within the area where the system has been initiated, but does not ensure any priority for call egress beyond this area. Hence, the Authority has not considered the combination of the GETS and MTPAS model for implementing priority routing in India.

2.18 The third option is implementation of eMLPP based priority and pre-emption of calls. Such implementation needs to be deliberated with reference to the following issues :

a) Feature availability: Availability and support of eMLPP feature in the networks of various TSPs;

b) Feature interoperability in multi-vendor multi-technology scenario: Possibility of eMLPP based priority routing in intra-operator as well as inter-operator call scenario across network elements of different make and different technologies (GSM, CDMA, 3G, fixed-line) in the home network and while roaming;

c) Cost involved in upgrading the networks;

d) Time involved in implementation.

2.19 A few stakeholders have expressed their concerns about the applicability of eMLPP based PCR in the inter-operator/ intra-operator setting in India. eMLPP is a feature that is based on an international global standard which has been available for quite some time. Further, its implementation has precedence, as WPS in USA is based on a variant of eMLPP feature (call preemption not used in USA). During the seminar conducted by TRAI on PCR, one stakeholder has pointed out that WPS deployment in USA is the American National Standard Institute (ANSI) version of eMLPP and has many customizations that may not be available in India.

2.20 eMLPP is a 3GPP standard which has been prevalent for almost a decade and has been improved on over time as can be seen from **Annexure-B**, which traces the history of development of this standard. In fact the earliest version of this standard was released by ETSI/3GPP in 1999. Multi-level precedence and preemption(MLPP) was recommended by the ITU in 1990 for ISDN standards and has been the focus of all disaster

relief related recommendations. The group of ITU recommendations (H.323) that defines the protocols for providing audio-visual communication sessions on any packet network, also have a set of recommendations on MLPP[9]. This is indicative of the fact that the MLPP standards are forward looking from the technology point of view.

2.21 Regarding concerns about the availability of eMLPP based priority routing features in the legacy network in India, it is very important for a disaster-prone country like India to prepare itself for unforeseen emergencies and therefore it is necessary to make a beginning. There is a possibility that some technologies or legacy networks may not support the eMLPP feature at this point of time. However what is more important is that the majority of the network is capable of supporting this feature. Over a period of time, legacy networks will be scrapped and future networks will automatically become capable of supporting this feature. It may not be practical to wait for a point of time where all networks elements of all operators would support such a feature. Even where network elements do support the feature, operators may not implement it on commercial considerations, as is the case today.

2.22 However, the fixed-line network will not be able to support the feature. But, given that more than 95% of the phones working in India are wireless, there will not be a huge impact if the feature is not available on the wired-line network. In all likelihood, most calls made to and from the disaster struck site will be from wireless/mobile phones. Therefore, even if the eMLPP based priority routing and pre-emption of calls for persons engaged in rescue and relief operations is implemented on GSM wireless networks, the purpose would be served. On the CDMA side, Telecommunications Industry Association's (TIA) has developed

[9] Recommendation ITU-T H.460.14 deals with "Support for Multi-Level Precedence and Preemption (MLPP) within H.323 Systems"

standards that are similar to eMLPP standards[10]. A PCR solution based on these standards can be implemented in CDMA networks. (Henceforth, in these recommendations wherever the term eMLPP is used, it also refers to an equivalent CDMA implementation).

2.23 During the consultation process, some of the telecom equipment manufacturers who have a considerable share of the telecom equipment market in India, have intimated that most of their equipment deployed in India supports the features of eMLPP. They have also opined that since the feature is based on 3GPP defined standards, it should work in call scenarios that involve inter-vendor network elements. This means that the feature can be implemented in a short time frame.

2.24 **The Authority, therefore, recommends that the eMLPP based priority call routing (PCR) should be implemented in wireless networks in India along with the right to pre-empt ongoing calls, if needed. The use of call pre-emption feature of eMLPP may be reviewed subsequently, based on the performance of the PCR scheme during emergencies.**

2.25 The next major issue is to assess the costs involved in implementing the eMLPP based PCR. Most stakeholders during the consultation process have stated that though available, the feature is currently not activated on their networks and they may have to incur additional capital expenditure in buying the feature from the concerned vendors. However, none of the stakeholders have indicated the definite costs and time required to upgrade their network to implement the feature. Despite a specific request to provide estimated cost figures neither TSPs nor telecom equipment vendors have provided the same.

[10] The CDMA implementation of wireless priority service is described in the TIA standard TIA-917 - Wireless Priority Service Enhancements for CDMA Systems. TIA-917 was created by TIA TR-45.2 Subcommittee on Core Networks and released in December 2004.

2.26 In absence of definite cost estimates, the following possibilities for getting the scheme implemented in India can be evaluated:

a. In view of the social importance of the issue, the TSPs take up the feature up-gradation as part of their Corporate Social Responsibility.

b. The Government can direct TSPs to implement the eMLPP feature support in their networks and recover the cost from users over a period of time.

c. The Government can financially support all or a few TSPs, either partially or fully, for eMLPP feature up-gradation on their network.

d. In case the costs involved in option c) above are expected to be very high, only the public sector companies - BSNL and MTNL - can be asked to implement the feature and they can be compensated by the Government for the costs involved.

2.27 The stakeholders, in their response to the issue, have already submitted that TSPs are not in a position to undertake CAPEX required for implementation of the PCR system due to various other financial / regulatory obligations that have to be met in the immediate future. This stand of the TSPs, therefore, rules out the first two options mentioned at a) and b) in the para above. The fourth option of asking BSNL and MTNL to implement the feature and accordingly compensate them for the cost incurred has an advantage that it would involve least costs. All the organisations that are involved in relief and rescue operations can be provided connections from these public sector companies to avail end-to-end priority treatment of calls. Both these operators combined have a pan-India presence and BSNL also has an extensive coverage of the rural areas.

2.28 The drawback of the above option in that if PCR is implemented only in PSU operators' networks, the priority feature may not be available if the network of BSNL/MTNL itself is down/non-functional. Therefore, in order to build redundancies in the PCR system, the Authority is of the opinion that at least 2-3 operators including one PSU in each service area should be selected for implementing this scheme. This can be implemented with Government financial support to all or a few telecom service providers, either partially or fully, for eMLPP feature up-gradation on their network. This aspect is analysed in detail in the following paragraphs.

2.29 Some of the PCR schemes implemented in developed countries are run on financial support from the Government (refer **Annexure-A**)**.** However, schemes like the Priority Access for Dialling (PADS) and WPS in Canada were not Government funded. They were on voluntary participation basis and were offered free of charge. However, the drawback is that there is no assurance that a scheme that is run voluntarily by industry will continue to operate. For example the PADS program has ended on December 31, 2010. Such a scenario may not be desirable for a crucial scheme like PCR. Therefore, in order to ensure continuity and control on the offering of the priority service scheme**, the Authority recommends that priority call routing scheme should be funded and overseen by the Government.**

2.30 The major problem in deciding to finance the up-gradation of the entire network of all the TSPs for implementing the scheme through eMLPP is that it is very difficult to estimate the costs involved. Some TSPs may already have the feature in their networks, while for TSPs having legacy network elements, the up-gradation to the eMLPP feature may require to be preceded by some software and hardware up-gradation. It is not possible for the Government to precisely estimate which network

elements need up-gradation for different TSPs. And, the Government should not end up funding unrelated up-gradations. Further, those TSPs who have upgraded their networks on their own, will end up getting less financial support as against those who have failed to keep pace with technological advancements; this would be inherently unfair to the former.

2.31 Two suggested approaches for arriving at the Government funding support required for implementing eMLPP based priority call routing are as follows -

A) **Approach 'A'** - One approach is to get the feature implemented in those networks which require least financial support from the Government. The most rational way of arriving at the financial support needed by a pre-decided number of telecom service providers would be through a market determined mechanism. This predefined number can be two private telecom service providers in a service area, in addition to BSNL/MTNL. Operators who wish to offer the PCR services can be asked to bid for the lowest possible amount that they would need to implement the services in their entire network. The two public sector undertakings would be mandatorily required to place the bids. Since TSPs that have large networks may require more number of network elements to be upgraded in comparison to those with small networks, the bids should be evaluated on the amount quoted by TSPs on 'per active subscriber basis'. The advantage of adopting this approach is that the costs involved in implementing eMLPP based priority routing of calls in India can be determined through a market based mechanism. The limitation of this approach is that the PCR services can, at best, be implemented in a maximum of three networks. Emergency responders and those availing PCR service will have to take connections from one of these networks. They will be able to avail priority calling amongst

themselves only in these three networks; beyond these three networks, if they dial a number, they are likely to encounter congestion.

B) Approach 'B' - The second approach of determining the costs involved in implementing PCR in India can be by implementing a pilot project. In this approach, one of the service areas can be chosen to implement PCR based on eMLPP on a pilot basis. The PCR will be implemented across all operators' network in this area. The service area chosen for PCR implementation should be small in terms of number of subscribers and yet all major telecom service providers should be operating in it. Himachal Pradesh is one such service area that can be chosen for PCR pilot implementation. Himachal Pradesh is relatively small in terms of area. However, the number of telephone connections being also small, the network elements that would require up-gradation for implementing eMLPP would be limited. This will help in carrying out the pilot at lower costs and analysis of the results too would be easy. **A Steering Committee comprising senior officers from TRAI, Telecom Engineering Centre(TEC), Department of Telecommunications(DoT), National Disaster Management Authority (NDMA) and Ministry of Home Affairs(MHA) may be constituted to steer the pilot.**

The mandate of the Committee would be to implement and study the pilot and give its recommendations on -

i. The costs involved in replicating the same across all operators throughout India;

ii. The interoperability issues involved in eMLPP implementation in inter-vendor, inter-technology and inter-domain connectivity (including those between GSM and CDMA networks) and technical solutions thereof;

iii. Suggest the service delivery model for PCR implementation;

iv. Suggest techniques to overcome signalling channel overload problems during high call attempts so as to compliment eMLPP implementation

v. Evaluate use of enhance overload performance features to address signaling channel congestion at various points in wireless networks like access channel, paging channel and processing overload[11];

vi. Suggest routing, queuing and priority treatment methodology for implementing PCR and high probability of call completion in fixed line and long distance networks[12];

Based on the recommendations of the Committee with respect to costs involved in carrying out the pilot, the amount to be reimbursed to each operator for implementing PCR in its entire network can be decided by the Government. However, to maintain a level playing field, as discussed in the first option (A), reimbursement of costs should be done at a uniform per active subscriber rate to all operators. This could be the average cost involved per active subscriber across all operators.

2.32 Approach 'A' has the advantage that it helps in market-based discovery of overall costs involved. However, implementation of this approach would result in implementation of PCR in a maximum of three TSPs networks. For calls that are made beyond the networks of these three TSPs, the priority service will not work. Approach 'B' has the advantage that the PCR scheme can be implemented across all wireless networks. Further, carrying out a pilot will help in providing solution to various technical

[11] Please refer to para A.35 in Annexure-I for further details

[12] (For this the committee may refer to ITU recommendations ITU-T Rec. E.106 (10/2003) on International Emergency Preference Scheme (IEPS) for Disaster Relief Operations which lists various Features and techniques to enhance call completion like - Priority call setup message through signalling network with high priority call identifier (HPC identifier), Priority indicator in bearer networks, Exemption from restrictive network management controls, such as call gapping (Exemption from RNMC), Prescription override, Avoidance routing, Diverse routing etc and suggests that use of these features is to be determined by each country, taking into account the capabilities of the networks being used)

issues that may arise in PCR in inter-operator cross-technology scenario. **The Authority therefore recommends that Approach 'B' as mentioned above (Para 2.31) be adopted to arrive at the costs involved in implementation of PCR for each telecom service provider. On successful implementation of PCR across the entire network the operators will file for reimbursement of their costs.**

2.33 For reimbursing the costs to the operators, one option could be that Universal Service Obligation Fund(USOF) could be utilised for this project. However, Universal Service Obligation is currently defined as an obligation to provide access to telegraph service to people in rural and remote areas at affordable and reasonable price. This definition of Universal Service is based on the concept that the access gap for use of telecom services should be supported through Government support in commercially non-viable areas. To fund implementation of PCR through the USOF would require amendment of the Indian Telegraph Act to expand the scope of USOF to fund projects beyond rural obligation. Given that the rural tele-density in India is still far below that in urban areas, the Authority does not find it logical to fund the PCR scheme from the USOF. It is a public responsibility of the Government to support creation of robust and resilient telecom networks so that during emergencies/ disasters, the provision of a reliable means of public telecommunications by TSPs can be ensured.

2.34 **Therefore, the Authority recommends that the capital expenditure for PCR scheme implementation should be funded by Government through budgetary allocation/support.**

2.35 Another issue is funding of operational expenses for running PCR Scheme. As per clause 46 of Chapter-IX of the Disaster Management Act 2005, National Disaster Response Fund has been created which is to be used for meeting any threatening disaster situation and it shall be made available towards meeting expenses for emergency response. Therefore

the Authority is of the opinion that this fund may be utilised for meeting operational expenses of PCR scheme. NDMA has also suggested that operational expenses for PCR scheme should be borne by National Disaster Relief Funds(NDRF)/State Disaster Relief Fund(SDRF).

2.36 Accordingly**, the Authority recommends that operational expenses for PCR scheme should be borne by National Disaster Relief Funds(NDRF)/SDRF**.

Service Usage Charges

2.37 One issue that requires deliberation is how the service will be charged. The charges levied in some of the models implemented globally have been discussed in detail in **Annexure-A**. In Canada, the major telecom operators, had been participating in the Priority Access for Dialing (PAD) program on a voluntary basis and offering PAD free of charge. In USA costs for WPS services may vary by cellular carrier, but they are limited to a maximum one-time activation fee, a per-month service fee, and per minute WPS calls. WPS charges are in addition to the basic calling plan. Applicable WPS charges are billed on the existing cellular service provider invoice and are payable directly to the cellular service provider.

2.38 Accordingly the Authority in its CP had asked for stakeholders' comments on charges to be levied from the users for availing priority calls. Some stakeholders have mentioned that cost estimates of implementing the entire scheme need to be worked out. It is imperative that no service provider be asked to bear the additional CAPEX for implementation of the scheme. If necessary, support from the USO fund may be looked at. Respective agencies that would be provided priority access to the scheme should be charged on actual-cost basis to meet the requirement of OPEX for running the scheme. Regulator and licensor may issue necessary

directions / amendments after fixing tariffs and rentals for availing emergency access.

2.39 Another stakeholder has suggested that the following charges should be levied from the users for availing the facility of priority call routing-

- One time activation fee
- Monthly service fee
- Additional per min call charges

2.40 One of the stakeholders has suggested that priority routed calls should be charged at Rs. 3 per minute so as to include the opportunity cost of the call denied access in the process of priority routing of the emergency call, the cost of software upgrades and maintenance of the systems and invocation and revocation cost. However, some stakeholders have opined that the tariff should be under forbearance. One of the stakeholders has suggested that no charges should be levied from the users for availing the facility of priority call routing as the proposed framework aims at society's and the nation's welfare.

2.41 The service usage charges for PCR scheme will depend on the CAPEX & OPEX that would be required for implementing the scheme. The same is not known at present and the Authority has already recommended that a pilot project may be carried out for determining the capital expenditure required for implementing the scheme. As the service usage charging is a tariff related issue and comes under the purview of TRAI. Therefore**, the Authority recommends that the issue of charging for PCR services will be decided after getting the data on cost incurred for providing the service.**

Service Delivery Model for PCR

2.42 For the PCR scheme to be implemented, the service delivery model needs to be finalized. If bottlenecks in service delivery are anticipated in advance, a more robust system for PCR can be put in place. Some of the key design elements of the service delivery model can be:

a) Identification of points of contacts

b) Standard operating procedure(SOP) for requesting priority SIM

c) Procedure for activating the service

d) Payments of bills

e) Complaint handling and resolution.

f) Web based application for supporting above services

2.43 In USA and UK implementation, there is a defined point of contact for each organization that is required to use web based application for placing requests for providing the service to different users. A generic model for service delivery is detailed in para A.37 of annexure-A.

2.44 In its CP the Authority had asked stakeholders' comments on the service delivery model and possible bottlenecks in its implementation. On the service delivery model design, most stakeholders have submitted the same details as those submitted in response to the question on choice of technical models. One of the stakeholders has suggested that since SIM card change is necessary for implementing priority call routing, pre-identification of the personnel requiring priority routing will be required. These personnel should have mobile phones supporting the eMLPP. Pre-identification is required as it may not be possible to provide SIMs and handsets at the time of emergency. Provisioning in HLR will be required for activating the service. On the issue of major bottlenecks in service delivery, the stakeholders have not given any concrete suggestions.

2.45 The delivery of PCR services to the emergency responders will depend on technical feasibilities and operational requirements of various organizations involved. **Therefore, the Authority recommends that the Steering Committee suggested for establishment as per para 2.31 may deliberate and decide upon the service delivery model for PCR implementation.**

Intra–circle roaming arrangement for PCR scheme

2.46 During emergencies, there can be situations where the network of one of the priority service providers is down/non-functional due to physical infrastructure failure. In such a situation it would be desirable that the subscribers of such a service provider get access and priority from some other service provider offering priority services and whose network is up and running. **The Authority, therefore, recommends that it should be mandatory for all service providers offering priority services to enter into intra-circle roaming arrangement as per their license conditions for their priority service users and ensure that PCR services are supported through roaming arrangements**.

CHAPTER III: IDENTIFYING ORGANIZATIONS AND PERSONNEL WORKING IN VARIOUS ORGANIZATIONS FOR GIVING PRIORITY ROUTING

3.1 Identification of the organizations involved in 'response and recovery' and personnel working in such organizations who should get priority routing is an equally important issue which needs to be addressed before putting in place a system for implementing PCR. If the PCR is not restricted to relief agencies and workers only and is made available to too many users, it can result in overload of the mobile network defeating the very purpose of the scheme. At the same time, restricting the facility to very few people also may not be a solution as, in such a scenario, persons will not be able to communicate with the team that is actually involved in relief and rescue operations at the disaster site.

3.2 The experience in USA and UK indicates that many Government departments and other organizations involved in relief and rescue do not realize the importance of the PCR scheme and they do not come forward actively to subscribe to such schemes. Precisely for this reason, in USA regional outreach coordinators were appointed with a mandate to popularize the scheme amongst organizations involved in relief and rescue. As a result, as on Dec 2012, there were about 300000 GETS and over 117,500 authorized WPS subscribers. Similarly, in UK, Telecommunications Sub Groups (TSGs) and the responder community has been involved in the Access Overload Control (ACCOLC) scheme to "devolve responsibility and management of the Scheme to the local level". Therefore it is imperative to choose and select organizations and persons working in them for priority routing and to identify the levels of priority that should be given to them. Hence, the Authority had asked the following questions in the CP dated 10th May,2012 –

- Which organizations and government departments that are involved in 'response and recovery' during emergency situations do you think should be part of this scheme?
- What mechanism should be followed to identify which personnel working in organizations identified in (a) above should get priority routing?

3.3 One of the stakeholders is of the view that levels of disasters have already been categorized and disseminated as L0, L1, L2, L3 by the National Disaster Management Authority (NDMA). It was of the opinion that the number of SIMs that should be given for priority routine should be restricted to 100, 2000 & 10,000 in L1, L2 & L3 levels of disaster respectively. It may be noted that level L1 disasters are those disasters that can be managed at district level. Similarly, level L2 disasters are those disasters that may require assistance and active participation and mobilization of resources at the state level. Level L3 disasters are large scale disasters that require assistance from the Central Government.

3.4 Another stakeholder has submitted that this question pertains to disaster management and inputs may be taken from the said organization / Government. However, in order to ensure up time of the telecom network / its recovery in the minimum possible time, telecom operators should also be given priority access.

3.5 National Disaster Management Authority (NDMA) which is the apex body for laying down the policies, plans and guidelines for disaster management has in its input to the CP, suggested various organizations and their levels of priority for implementation in India. The same have been given in **Annexure-C**.

3.6 Internationally, in countries where priority routing has been implemented, the organizations that will use priority services have been identified and levels of priority have been defined for different types of users. The implementation of priority levels and passing of priority information across networks needs to be supported by the technical model. eMLPP standard provides for seven levels of priority[13]. The Authority is of the view that it is the prerogative of the Government to decide the organizations / persons entitled to get priority routing and what their priority level should be. Hence, these decisions may be taken by the Government.

Structure, role and reporting of the unit that will be entrusted with the responsibility of implementing and monitoring the proposed scheme

3.7 For putting in place a priority access scheme for calls for persons engaged in emergency relief and rescue operations in India, the structure, role and reporting of the unit that should be entrusted with the responsibility of implementing and monitoring the proposed scheme will be an important issue that need to be addressed. If we look at global practices, the WPS service in USA is overseen by the Federal Communications Commission and administered by the National Communications System in the Department of Homeland Security. In Canada, Industry Canada's Emergency Telecommunications team is responsible for emergency telecommunications planning, preparedness and response and works in collaboration with federal and provincial governments and the telecommunications industry to achieve these goals. In UK the Cabinet Office Civil Contingencies Secretariat (CCS) has defined different resilient communication options which are available to responders as part of privileged access schemes. Accordingly, the Authority in its CP dated 10th

[13] http://www.3gpp.org/ftp/Specs/html-info/22067.htm

May 2012 had asked for the stakeholders comments on whether there should be a separate Unit/Division under DoT / TRAI to monitor the implementation of the scheme. If yes, what should be the structure and role of this unit?

3.8 In response, a few stakeholders have opined that the first priority is to decide on the technology to be used / network topography, call routing, cost estimates, funding of the entire scheme, etc. The monitoring body and mechanism can be decided at a later point of time. A couple of stakeholders have submitted that there should not be any separate Unit/Division under DoT/TRAI to monitor the implementation of the scheme.

3.9 One stakeholder has opined that once the regulations on priority routing are promulgated, implementation rests with the telecom service providers and monitoring with field units of DoT. Coordination functions can be discharged by existing establishment at TRAI/DoT. However, in its opinion, there exists a case for a separate 'Public Safety Communications' division if TRAI adopts a holistic and comprehensive approach towards public safety communications and address some of the issues already identified.

3.10 One of the stakeholders has opined that there should be a separate team to monitor the implementation of the scheme to ensure speedy facilitation of work. Another stakeholder has suggested that there should be a separate cell in DoT to monitor the implementation of the scheme. This cell can be responsible for :-

- Installation and commissioning of platform(s) required common to all operators on the same lines as that of MNP
- Coordination among operators for upgradation of their networks for implementation and testing of the same.
- Periodic check of the functioning of the system across all operators.

- Providing priority calling facilities to designated persons / organizations as per decided policy.
- Carry out day to day operational and coordination issues among all concerned for the said system.
- Review the system from time to time based on need, experience, technology advancements, etc.

3.11 Though the focus of these recommendations is on priority routing of calls during emergencies, the Authority understands that there is an entire gamut of activities that the International Telecommunication Union (ITU) has defined under Emergency Telecommunication. Some of these activities that need to be undertaken in a country during various phases of disasters are summarised below -

- **Preparedness**

a) Capacity building – Formulation National Telecom Emergency Plans, Training

b) Partnerships (e.g., INMARSAT, WMO, WGET, OCHA, IARU)

c) Listing of currently available frequencies for use in emergency situations

- **Prediction and detection**

d) Using radio-based remote sensing systems play a major role in for prediction and detection of disasters (such as hurricanes, earthquakes and tsunamis, floods, fires, dangerous pollution, etc.)

- **Mitigation**

e) Damage assessment for planning relief operations

f) Spectrum management through establishment of globally/regionally harmonized frequency bands

g) Support to emergency broadcasting, maritime and public safety signals

h) Support and training to Amateur Radio users

- **Response**

i) Reconstruction - rapidly restore communications capabilities, coordination of relief activities

j) Global circulation of emergency equipment across borders

k) Appropriate project management techniques

l) Legal and regulatory issues (Tampere + GSR)

m) Standardization work on call priority & alert message delivery

3.12 The introductory section of these recommendations clearly brings out the role of telecommunications in disaster management. A holistic approach towards managing telecommunication during emergencies/disasters in India can be adopted in future only when an exclusive setup is created for the same with the responsibility of developing, maintaining and executing the emergency telecommunications plans. The approach to emergency telecommunication needs to be supported by multiple stakeholders from various government departments and the industry. The Authority is of the opinion that there should be Standing Committee to oversee policy for Emergency/Disaster communications in India. Since relief and response operations are handled by the Central and State Governments, such a Committee should be headed by the Union Home Secretary. Accordingly, t**he Authority recommends that a Standing Committee, under the Union Home Secretary, comprising senior officers from DoT, TRAI, NDMA, TEC, and representatives from industry should be formed. This Committee should be responsible for overseeing the policy with respect to Emergency Telecommunications in India in general and the following aspects in particular –**

a) **Formulation of National Telecom Emergency Plans,**

b) **Prescribing sectoral Standard Operating Procedures (SOPs) for effective and early mitigation during disasters and emergencies**

c) **Capacity building across various government departments, relief and rescue operators and telecom service providers in respect of making the telecom networks resilient to disasters / emergencies**

d) **Support to emergency broadcasting, maritime and public safety signals**

e) **Support and training to Amateur Radio users**

f) **Reconstruction - rapidly restore communications capabilities, coordination of relief activities**

g) **Encourage research and development and promote indigenous solutions related to Emergency Telecom by creating a forum of service providers, system suppliers and test equipment vendors.**

h) **Any other Emergency Telecom related work assigned by the Government**

CHAPTER IV: SUMMARY OF RECOMMENDATIONS

A summary of recommendations has been provided in this section to list out the salient points made in these recommendations in a focused manner. However, it may kindly be noted that the recommendations are to be read in totality along with the reasoning and analysis provided in detail in the previous chapters.

4.1. **The Authority recommends that a priority call routing scheme should be instituted to ensure that calls of personnel responsible for 'response and recovery' during disasters are routed on priority**. **[Para 1.20]**

4.2. **The Authority recommends that the eMLPP based priority call routing (PCR) should be implemented in wireless networks in India along with the right to pre-empt ongoing calls, if needed. The use of call pre-emption feature of eMLPP may be reviewed subsequently, based on the performance of the PCR scheme during emergencies. [Para 2.24]**

4.3. **The Authority recommends that priority call routing scheme should be funded and overseen by the Government. [Para 2.29]**

4.4. **A Steering Committee comprising of senior officers from TRAI, Telecom Engineering Centre(TEC), Department of Telecommunications(DoT), National Disaster Management Authority (NDMA) and Ministry of Home Affairs(MHA) may be constituted to steer the pilot. [Para 2.31]**

4.5. **The Authority recommends that Approach 'B' as mentioned in Para 2.31 be adopted to arrive at the costs involved in implementation of PCR for each telecom service provider. On successful implementation of PCR across the entire network the operators will file for reimbursement of their costs. [Para 2.32]**

4.6. **The Authority recommends that the capital expenditure for PCR scheme implementation should be funded by Government through budgetary allocation/support. [Para 2.34]**

4.7. **The Authority recommends that operational expenses for PCR scheme should be borne by National Disaster Relief Funds(NDRF)/SDRF. [Para 2.36]**

4.8. **The Authority recommends that the issue of charging for PCR services will be decided after getting the data on cost incurred for providing the service. [Para 2.41]**

4.9. **The Authority recommends that the Steering Committee suggested for establishment as per para 2.31 may deliberate and decide upon the service delivery model for PCR implementation. [Para 2.45]**

4.10. **The Authority recommends that it should be mandatory for all service providers offering priority services to enter into intra-circle roaming arrangement as per their license conditions for their priority service users and ensure that PCR services are supported through roaming arrangements. [Para 2.46]**

4.11. **The Authority recommends that a Standing Committee, under the Union Home Secretary, comprising senior officers from DoT, TRAI, NDMA, TEC, and representatives from industry should be formed. This Committee should be responsible for overseeing the policy with respect to Emergency Telecommunications in India in general and the following aspects in particular –**

i) Formulation of National Telecom Emergency Plans,

j) Prescribing sectoral Standard Operating Procedures (SOPs) for effective and early mitigation during disasters and emergencies

k) Capacity building across various government departments, relief and rescue operators and telecom service providers in respect of making the telecom networks resilient to disasters/ emergencies

l) Support to emergency broadcasting, maritime and public safety signals

m) Support and training to Amateur Radio users

n) Reconstruction - rapidly restore communications capabilities, coordination of relief activities

o) Encourage research and development and promote indigenous solutions related to Emergency Telecom by creating a forum of service providers, system suppliers and test equipment vendors.

p) Any other Emergency Telecom related work assigned by the Government. [Para 3.12]

List of Abbreviations used

S.No.	Abbreviation	Expansion
1.	3G	3rd Generation
2.	ACCOLC	Access Overload Control
3.	AT&T	American Telephone and Telegraph
4.	AUSPI	Association of Unified Telecom Service Providers of India
5.	BSNL	Bharat Sanchar Nigam Limited
6.	BTS	Base Transceiver Station
7.	CAPEX	Capital Expenditure
8.	CCR	Call Completion Rate
9.	CCS	Civil Contingencies Secretariat
10.	CDMA	Code Division Multiple Access
11.	COAI	Cellular Operator Association of India
12.	CP	Consultation Paper
13.	CSSR	Call set-up success rate
14.	CWC	Central Water Commission
15.	DITCO	Defense Information Technology Contracting Organization
16.	DG	Diesel Generator
17.	DISN	Defense Information System Network
18.	DRH	Directed Retry Handover
19.	eMLPP	Enhanced Multi-Level Precedence & Pre-emption
20.	EVNO	Emergency Virtual Network Operator
21.	FCC	Federal Communications Commission
22.	FCI	Food Corporation of India
23.	FOC	Full Operational Capability
24.	FTS	Federal Telecommunications System

S.No.	Abbreviation	Expansion
25.	GETS	Government Emergency Telecommunications Service
26.	GPS	Global Positioning System
27.	GSM	Global System for Mobile Communication
28.	GSR	Global Symposium for Regulators
29.	HLR	Home Location Register
30.	HPC	High Probability of Completion
31.	IARU	International Amateur Radio Union
32.	IMD	India Meteorological Department
33.	INCOIS	Indian National Center for Ocean Information Services
34.	INMARSAT	International Maritime Satellite
35.	IOC	Initial operational capability
36.	ISUP	ISDN User Part; ISDN - Integrated Services Digital Network
37.	ITCs	Independent Telephone Companies
38.	ITU	International Telecommunication Union
39.	IXCs	Interexchange Carriers
40.	LECs	Local Exchange Carriers
41.	MEA	Ministry of External Affairs
42.	MHA	Ministry of Home Affairs
43.	MNP	Mobile Number Portability
44.	MOES	Ministry of Earth Sciences
45.	MTNL	Mahanagar Telephone Nigam Limited
46.	MTPAS	Mobile Telecommunications Privileged Access Scheme
47.	MVNOs	Mobile Virtual Network Operators
48.	NANP	North American Numbering Plan
49.	NCMC	National Common Mobility Card

S.No.	Abbreviation	Expansion
50.	NCS	National Communications System
51.	NDMA	National Disaster Management Authority
52.	NDRF	National Disaster Response Force
53.	NEC	Northern Eastern Council
54.	NGO	Non-Governmental Organisation
55.	NLD	National Long Distance
56.	NS/EP	National Security/Emergency Preparedness
57.	NSF	National Science Foundation
58.	NTP 2012	National Telecom Policy 2012
59.	O&M	Operations and Maintenance
60.	OCHA	Office for the Coordination of Humanitarian Affairs
61.	OHD	Open House Discussion
62.	OTA	Over- the-air
63.	PAD	Priority Access for Dialing
64.	PACA	Priority Access and Channel Assignment
65.	PBG	Performance Bank Guarantee
66.	PCR	Priority Call Routing
67.	PCS	Personal Communication Service
68.	PDC	Program Designator Code
69.	PIB	Press Information Bureau
70.	PIN	Personal Identification Number
71.	POC	Point of Contact
72.	POI	Point of Interconnection
73.	PSAP	Public Service Answering Point
74.	PSTN	Public Switched Telecom Network
75.	PSU	Public Sector Undertaking

S.No.	Abbreviation	Expansion
76.	PTI	Press Trust of India
77.	PWD	Public Works Department
78.	QoS	Quality of Service
79.	RBOCS	Regional Bell Operating Companies
80.	SCG	Strategic Command Group
81.	SI	System Integrator
82.	SIM	Subscriber Identification Module
83.	SOPs	Standard Operating Procedures
84.	TEC	Telecom Engineering Centre
85.	TERM	Telecom Enforcement, Resource and Monitoring
86.	TSGs	Telecommunications Sub Groups
87.	TSPs	Telecom Service Providers
88.	UAS	Unified Access Service
89.	UMTS	Universal Mobile Telecommunication System
90.	USO	Universal Service Obligation
91.	USOF	Universal Service Obligation Fund
92.	VLR	Visitor Location Register
93.	WMO	World Meteorological Organization
94.	WPS	Wireless Priority Service

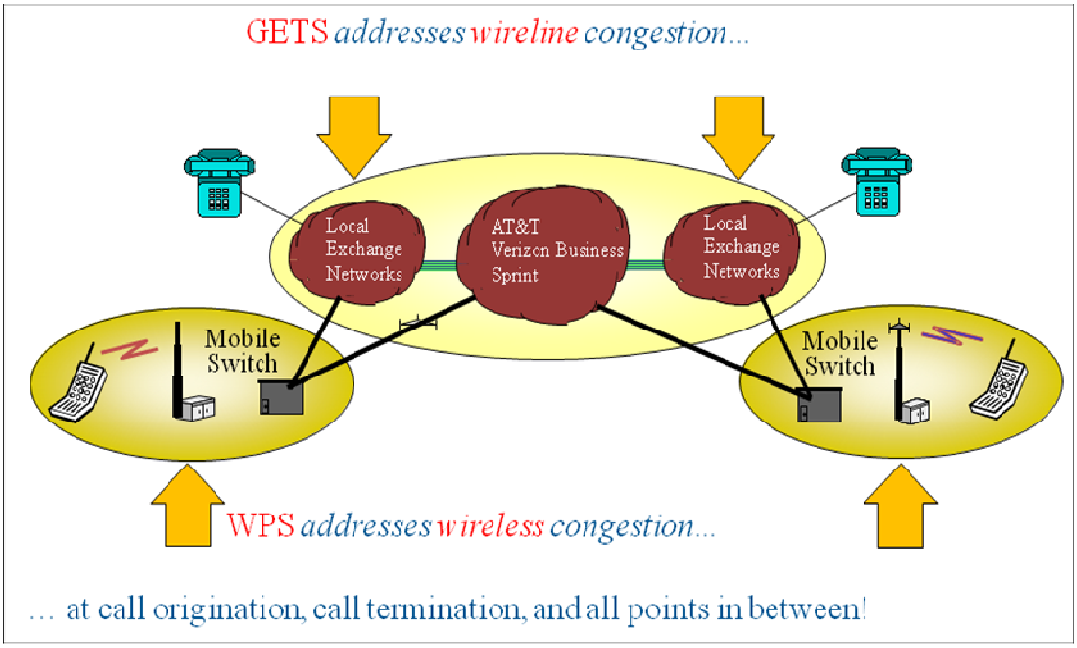
Annexure – A

Priority Call routing - International practices

A.1 Some of the systems that have been developed in various countries to ensure that calls of Government machinery/personnel and other important organizations/NGOs go through the telecom network during times of emergency are detailed below -

UNITED STATES

A.2 In USA, the telecom regulator, Federal Communications Commission (FCC) had approved commercial carriers call-by-call priority on the Public Switched Networks on August 30, 1995. Accordingly, GETS services came into existence for priority routing of wired line calls. Later in 2000, WPS services were introduced to address wireless radio network congestion issues.



A.3 The Prioirity call services in USA i.e. GETS and WPS together were planned from scratch to cover 117 million access lines. The software development was taken up in conjunction with the telecom equipment manufacturers and was later deployed across the existing networks. The aim was to cover 14000 wireline switches and 7500 wireless switches. For the same the government entered into contract with three long distance carriers i.e. AT&T, Verizon and Sprint and one system integrator (CSC) whose role was to enter into further sub contracts with access service providers for deploying software feature upgrades for priority access services in their network elements and support the provisioning and monitoring of the service. At present there are about 300000 GETS and Over 117,500 Authorized WPS Subscribers.

A.4 In USA the GETS and WPS services are being offered across the networks. GETS Priority access from any domestic or international phone is available on >87% Access Lines whereas WPS is provisioned in all major nationwide and several regional wireless service providers. In fact, WPS (GSM) has interoperability with WPS implementation in Canada.

A.5 Implementation of wireless priority services in USA has been in three phases that were spread across a period of 3 to 4 years –

- Limited capability phase (priority implemented only in backbone)
- Initial operational capability (IOC)
- Full Operational Capability (FOC)

The details about the two priority services i.e. GETS and WPS are as follows -

i. Government Emergency Telecommunications Service (GETS)

The concept of GETS[14]

A.6 The Government Emergency Telecommunications Service (GETS) is an emergency phone service provided by the National Communications System (NCS) in the Office of Cybersecurity and Communications Division, National Protection and Programs Directorate, Department of Homeland Security. GETS supports Federal, State, local, and tribal government, industry, and non-governmental organization (NGO) personnel in performing their National Security and Emergency Preparedness (NS/EP) missions. GETS provides emergency access and priority processing in the local and long distance segments of the Public Switched Telephone Network (PSTN).

A.7 Using enhancements based on existing commercial technology, GETS allows the National Security or Emergency Preparedness (NS/EP) community to communicate over the existing Public Switched Telephone Network (PSTN) paths with a high likelihood of call completion during the most severe conditions of high-traffic congestion and disruption. The result is a cost effective, easy-to-use telephone service that is accessed through a simple dialing plan and Personal Identification Number (PIN) card verification methodology. It is maintained in a constant state of readiness and provides a cost-effective means to overcome network outages through such methods routing alternatives, priority service and other enhancements that do not exist for normal PSTN calls.

A.8 GETS services are provided over three categories of networks. These networks are as follows:

[14] Based on information available in public domain at http://gets.ncs.gov/ and discussions held with FCC team

- The major long-distance networks provided by Interexchange Carriers (IXCs) - AT&T, Verizon and Sprint - including their international services.
- The local networks provided by Local Exchange Carriers (LECs) such as the Regional Bell Operating Companies (RBOCS) and Independent Telephone Companies (ITCs), cellular carriers and personal communications services (PCS).
- Government-leased networks, including the Federal Telecommunications System (FTS) and the Defense Information System Network (DISN).

GETS Access

A.9 GETS is accessed through a universal access number 1-710-NCS-GETS (1-710-627-4387) using common telephone equipment such as a standard desk set, facsimile, modem, or wireless phone. The dialing plan is based on the North American Numbering Plan (NANP) area code that is reserved for National Security/Emergency Preparedness (NS/EP) use. This area code is valid in the three interexchange carriers (IXCs) that support GETS (AT&T, Verizon Business, and Sprint) and all local exchange carriers (LECs), wireless carriers, and foreign carriers. The normal access mode is through user's pre-subscribed long distance carrier by dialing the universal access number (provided to qualified users on a GETS dialing card). If this is not successful or if user has not subscribed to one of the GETS IXCs, he may access GETS by first dialing 1010288 for AT&T, 1010222 for Verizon Business, or 1010333 for Sprint, followed by the universal access number. A prompt will direct the entry of the GETS PIN and the telephone number. Once a user has been authenticated as a valid user, the call is identified as an National Security and Emergency Preparedness (NS/EP) call and receives priority treatment. Users dial a country code and then the GETS 710 number.

The GETS system is available worldwide with the limitation that priority routing is only available from U.S. Carriers who participate in the program. LECs, wireless, and foreign carriers will route GETS calls to one of the three GETS IXCs, who have each implemented enhanced routing services for GETS calls in their networks. Enhanced routing capabilities have also been implemented in many LEC networks also. It is not possible to use GETS to dial a toll-free destination number.

A.10 GETS traffic receives priority treatment over normal traffic through:

- Controls such as trunk queuing, trunk sub-grouping, or trunk reservation
- Exemption from protective network management controls, which are used to reduce network congestion
- High probability of completion (HPC) capability to provide
    - NS/EP identification
    - Priority signaling

These features enhance the capability of NS/EP calls to be completed in congested networks. GETS will not preempt public traffic, nor are there levels of precedence in GETS.

Figure - GETS Operational Concept

Funding for GETS

A.11 There are two sources of funding for GETS. There is an annual budget to compensate carriers, systems integrators, and large switch manufacturers for the investments required to support GETS. In addition, there are user fees. The charge is for usage when making calls using a GETS card. GETS calls are billed at a rate of 7 cents or 10 cents per minute (depending on carrier and other factors) for calls within the United States and its territories, Canada, and most of the Caribbean. The cost is higher if operator assisted or originating from certain pay phones. International calls are billed at commercial rates, though international calling privileges are restricted to those cards so authorized by your organization's Point of Contact (POC) or alternate. Federal government organizations are exempt from billing until an annual threshold for GETS calls has been exceeded. However, the National Communications System (NCS) reserves the right to bill federal users for GETS calls if there has been fraud, waste, or abuse using your GETS card.

A.12 For organizations outside the federal government, a Program Designator Code (PDC) is required to establish a billing account for payment of GETS calls placed by members of participating organizations. GETS charges are payable to the contracting office i.e. Defense Information Technology Contracting Organization (DITCO). Details on paying these charges would be included with the bill participating organizations receive from them.

A.13 The use of GETS services by authorized nonfederal users, including local governments, state governments, and certain nonprofit entities, like the Salvation Army and Red Cross, is billed for the cost of the calls, as required by federal law. Each year NCS establishes a budget for the expected cost of user fees. Monthly carrier payments are drawn from this fund. NCS receives a monthly call detail report from the carriers identifying all GETS calls. The NCS staff reviews these calls to check that only authorized personnel are using the service and to identify cases of possible abuse.

Performance of GETS so far

A.14 GETS is designed to provide 90% call completion rates when call volume is eight times greater than normal capacity. In actual emergencies, GETS has consistently met or exceeded this completion rate. There have been relatively very few times where GETS operation has been necessary. During the Nisqually Earthquake near Seattle in 2001, there were almost 400 successful GETS calls. Hurricane Opal in 1995 saw over 2000 successful GETS calls. Both of these emergencies were major operational successes for GETS.[15] The terrorist attack on September 11th, 2001 again showed the GETS program to be very capable, although one major flaw came to light and is in the process of

[15] US GETS market Insight http://www.corp.att.com/stateandlocal/docs/US_GETS_Market_Insight.pdf

being remedied. The first major hurdle of the terrorist attack was the flood of communication that hit the public networks during and after the attack. It is estimated that traffic increased by 400% above normal in traffic levels. Both the Pentagon and the World Trade Center Towers were three of the largest communications hubs in the world. The World Trade Center alone housed several billion dollars worth of communications equipment and numerous cellular towers. Even with the communications infrastructure destruction the success rate of GETS calls was 95% completion rate during the 9/11 tragedy.

A.15 The major problem with the GETS system was the inability to prioritize wireless calls. This meant that the GETS user attempting to use the GETS system through a wireless device had to first get connected to the wireless network before accessing the GETS system. This was very problematic during the crisis because of the overload in wireless communications and damage to infrastructure. As a resolution to this problem, on April 17, 2002 the NCS approved a subcontract award from DynCorp to VoiceStream for Wireless Priority Service (WPS) for the Washington, DC and New York City areas. Wireless Priority Service (WPS) is a similar priority call routing arrangement in US wireless networks and is discussed in the WPS section.

GETS Eligibility Criteria

A.16 Typical GETS users are responsible for the command and control functions critical to management of and response to national security and emergency situations, particularly during the first 24 to 72 hours following an event. A similar hierarchy exists in the WPS system and has been discussed in detail in following sections.

GETS - Key features summarized

A.17 Key features of GETS can be summed up as follows -

- Toll-free access number with alternate numbers for direct carrier access
- Access control using Personal Identification Numbers (PINs)
- Failsafe access - if the access control system fails, GETS calls would automatically be allowed to complete
- Enhanced routing to one of the three interexchange (long distance) carriers
- Alternate carrier routing in the event one of the carriers is unavailable
- Priority treatment with trunk queuing, sub-grouping, and reservation
- Exemption from restrictive network management controls during congestion
- International calling (when requested and authorized in advance)
- Interoperability with other networks
- Number translation (for special users)

ii. **Wireless Priority Service (WPS)**[16]

What is WPS?

A.18 The Nationwide Wireless Priority Service (WPS) is a system in the United States that allows high-priority emergency telephone calls to avoid congestion on wireless telephone networks. This complements the Government Emergency Telecommunications Service (GETS), which allows such calls to avoid congestion on landline networks. The service is overseen by the Federal Communications Commission and administered by the National Communications System in the Department of Homeland Security.

[16] The details in this section are based on information provided in public domain at http://wps.ncs.gov/index.html and discussions held with FCC team

A.19 The FCC rules do not require cellular providers to offer WPS; it is a voluntary offering. Although the FCC maintains oversight of the WPS program, the Department of Homeland Security's National Communications System (NCS) is responsible for its day-to-day administration.

A.20 During emergencies, WPS gives authorized NS/EP personnel priority cellular access before subscribers who do not have WPS. Even absent emergencies, some towers and networks receive more calls than they can handle. WPS allows high-priority calls to bypass that congestion and receive priority by dialing *+272+DST_NUMBER+send (the 'star' key followed by 272 followed by the destination number followed by the dial key).

A.21 Before using the system, each user must receive authorization from the National Communications System and subscribe to the service with a participating provider.

A.22 Although the system is said to ensure a high probability of call completion, it is not without serious limitations. The WPS will not preempt calls in progress, so the user will have to wait for bandwidth to open. It is also not yet supported by all carriers. In order for a call to work, telephone infrastructure must be powered and functioning. Finally, a call that receives priority using WPS does not automatically get priority on landline networks. Therefore, congestion on the Public Switched Telephone Network may prevent the call from completion unless the user makes additional steps to access the GETS service for landline calls as well. Because of these and other limitations, the WPS explicitly does not guarantee call completion.

WPS - Service Description

A.23 WPS is an add-on feature subscribed on a per-cell phone basis that works with existing cell phones in WPS enabled cellular networks; no special phones are required. WPS provides priority for emergency calls through a combination of special cellular network features and the same "High Probability of Completion" features used by GETS. These are detailed below:

a. *Originating Radio Channel Priority:* WPS addresses congestion in the local radio access channel (or cell), which is often the reason that cellular calls cannot be made during heavy calling periods or when damage to network infrastructure occurs. WPS automatically provides priority access to local radio channels, placing WPS calls in queue for the next available channel if a channel is not immediately available. Originating Radio Channel Priority requires WPS feature activation on the calling cellular phone. WPS calls do not preempt calls in progress nor will WPS users monopolize all available cellular resources.

b. *High* Probability *of Completion Features*: When a radio access channel becomes available and the call proceeds, WPS calls are assigned a unique "NS/EP" call marking by the cellular network switching equipment. This marking triggers industry standard *High Probability of Completion (HPC)* features residing in most U.S. telecommunications networks as calls are routed from the originating cell to the called cellular or landline phone. These HPC features significantly increase the probability of call completion should the call encounter network congestion or blockage beyond the originating cell. Thus, WPS calls receive similar "across the network" priority as GETS calls without having to dial the GETS access number and PIN.

c. *Terminating Radio Channel Priority:* Incoming WPS (and GETS) calls to cell phones served by WPS enabled cellular networks automatically receive priority access to local radio channels, placing incoming GETS and WPS calls in queue for the next available channel if a channel is not immediately available. Terminating Radio Channel Priority does not require the called cellular phone to be subscribed to WPS. Incoming GETS and WPS calls do not preempt cellular calls in progress nor will they monopolize all available cellular resources.

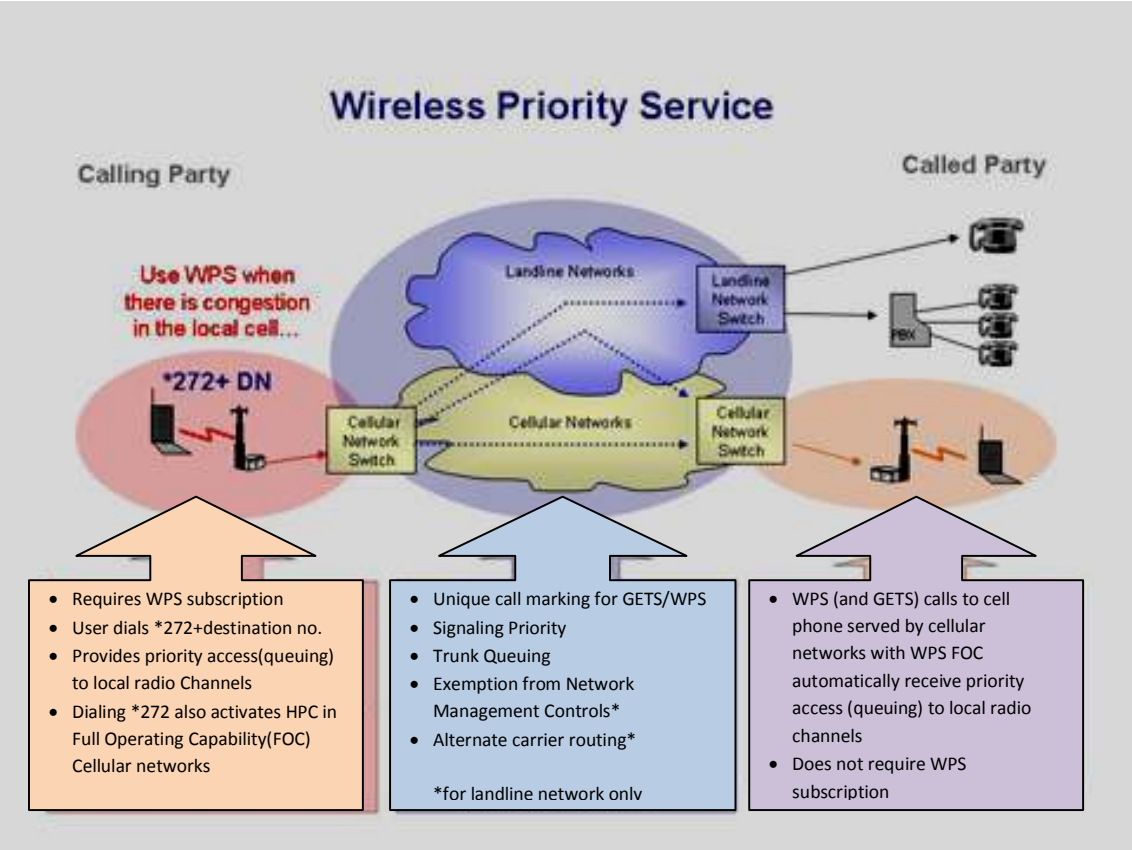


Figure 2 – How Wireless Priority Service Works

Source - http://wps.ncs.gov/images/diagram01a.jpg

A.24 WPS uses specifications which are similar to what later came to be known as eMLPP in the GSM standards. However WPS in USA utilizes precedence feature of eMLPP for queuing of calls by priority level but

does not preempt the calls. All WPS priority queuing capabilities were built for 2G technologies for both GSM and CDMA. For implementing the priority services in UMTS (3G networks) Directed Retry Handover (DRH) is being used. If WPS calls cannot complete on UMTS (3G) (e.g., iPhone), they are handed over to GSM (2G) to receive WPS priority treatment. The capability has been tested and deployed by GSM carriers (AT&T Mobility and T-Mobile) in 2011.

WPS structure

A.25 WPS and its companion priority service, the Government Emergency Telecommunications Service (GETS), are requested through a secure on-line system GETS-WPS Information Delivery Service (G-WIDS) on WPS website (wps.ncs.gov) or on Telephone: (866-NCS-CALL). Before requests can be submitted each organization needs to establish a G-WIDS Point of Contact (POC). Most organizations have a single POC (and Alternate POC) for administering both GETS and WPS. However, large or geographically disbursed organizations may elect to establish separate POCs to administer GETS and WPS for different departments and/or locations. The GETS/WPS POC serves as each organization's program administrator. Once an organization has an established POC, they can request GETS and WPS. Upon WPS approval, POC forwards carrier account activation information to NCS. NCS orders WPS feature added to user's basic service if user does not already have carrier service, user acquires basic commercial service The NCS recommends that each WPS user also have a GETS card. Carrier personnel are unable to process requests for WPS directly. All WPS service requests must be made through G-WIDS.

A.26 Service Availability - Wireless Priority Service is widely available from Alltel, AT&T, Cellcom, Cellular South, SouthernLINC, Sprint Nextel, Sprint PCS, T-Mobile, and Verizon Wireless. Cellular service provider

participation in the WPS program is voluntary. Participating service providers typically deploy WPS in stages until service is available in most coverage areas and functionality has reached Full Operating Capability (FOC).

A.27 Changing Service Providers - Should a WPS user wish to change service providers, whether transferring their existing telephone number or obtaining a new number, they must have their POC submit a change request through G-WIDS. The NCS will coordinate between service providers to transfer the WPS subscription, if WPS is available, to the new service provider. The service transfer cannot be arranged through the new service provider

WPS NS/EP criteria for defining users

A.28 Different priority levels have been defined for various types of eligible WPS users as follows –

Priority 1 - Executive Leadership and Policy Makers

A.29 Users who qualify for the Executive Leadership and Policy Makers priority have been assigned priority one. A limited number of CMRS technicians who are essential to restoring the CMRS networks shall also receive this highest priority treatment. Examples of those eligible include:

a) The President of the United States, the Secretary of Defense, selected military leaders, and the minimum number of senior staff necessary to support these officials
b) State governors, lieutenant governors, cabinet-level officials responsible for public safety and health, and the minimum number of senior staff necessary to support these officials
c) Mayors, county commissioners, and the minimum number of senior staff to support these officials

Priority 2 - Disaster Response/Military Command and Control

A.30 Users who qualify for the Disaster Response/Military Command and Control priority will be assigned priority two. Individuals eligible for this priority include personnel key to managing the initial response to an emergency at the local, state, regional and federal levels. Personnel selected for this priority should be responsible for ensuring the viability or reconstruction of the basic infrastructure in an emergency area.

In addition, personnel essential to continuity of government and national security functions (such as the conduct of international affairs and intelligence activities) are also included in this priority. Examples of those eligible include:

a) Federal emergency operations center coordinators, e.g., Manager, National Coordinating Center for Telecommunications, National Interagency Fire Center, Federal Coordinating Officer, Federal Emergency Communications Coordinator, Director of Military Support
b) State emergency services Director, National Guard Leadership, State and Federal Damage Assessment Team Leaders
c) Federal, state and local personnel with continuity of government responsibilities
d) Incident Command Center Managers, local emergency managers, other state and local elected public safety officials
e) Federal personnel with intelligence and diplomatic responsibilities.

Priority 3 - Public Health, Safety, and Law Enforcement Command

A.31 Users who qualify for the Public Health, Safety, and Law Enforcement Command priority will be assigned priority three. Eligible for this priority are individuals who direct operations critical to life, property, and

maintenance of law and order immediately following an event. Examples of those eligible include:

a. Federal law enforcement command
b. State police leadership
c. Local fire and law enforcement command
d. Emergency medical service leaders
e. Search and rescue team leaders
f. Emergency communications coordinators

Priority 4 - Public Services/Utilities and Public Welfare

A.32 Users who qualify for the Public Services/Utilities and Public Welfare priority will be assigned priority four. Eligible for this priority are those users whose responsibilities include managing public works and utility infrastructure damage assessment and restoration efforts and transportation to accomplish emergency response activities. Examples of those eligible include:

a. Army Corps of Engineers leadership
b. Power, water and sewage and telecommunications utilities
c. Transportation leadership

Priority 5 - Disaster Recovery

A.33 Users who qualify for the Disaster Recovery priority will be assigned priority five. Eligible for this priority are those individuals responsible for managing a variety of recovery operations after the initial response has been accomplished. These functions may include managing medical resources such as supplies, personnel, or patients in medical facilities. Other activities such as coordination to establish and stock shelters, to obtain detailed damage assessments, or to support key disaster field office personnel may be included. Examples of those eligible include:

a. Medical recovery operations leadership

b. Detailed damage assessment leadership
c. Disaster shelter coordination and management
d. Critical Disaster Field Office support personnel

WPS Costs

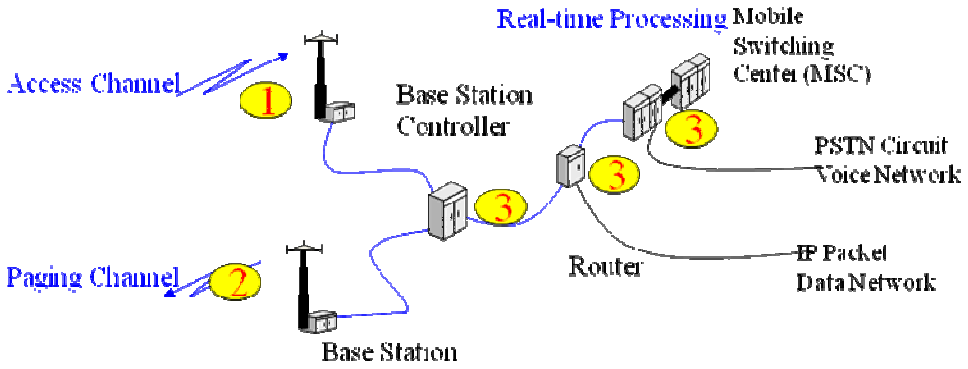
A.34 Costs may vary by cellular carrier, but they are limited to a maximum $10 one-time activation fee, a $4.50 per-month service fee, and $ .75 per minute for WPS (*272) calls. WPS charges are in addition to the basic calling plan. Applicable WPS charges are billed on the existing cellular service provider invoice and are payable directly to the cellular service provider.

A.35 WPS has performed well in general. However it was observed that subscriber growth and the dramatic increase in text messaging are impacting signaling channel resources in extreme congestion situations. The LA earthquake (2008), Presidential Inauguration (2009) and East Coast earthquake (2011) events have shown that at the time of the WPS solution development, signaling channels were deemed under-utilized with an extremely low risk of congestion, but now they can become congested during major NS/EP events. Wireless carrier technology advances have allowed voice channel capacity to expand faster than signaling channel capacity. The signaling channel capacity utilized to establish and manage wireless voice calls and other services has remained essentially the same. To tackle the issue an enhance overload performance feature has been added to address signaling channel congestion at three new congestion points

Access Channel Origination Signaling Overload - 1

Paging Channel Termination Signaling Overload - 2

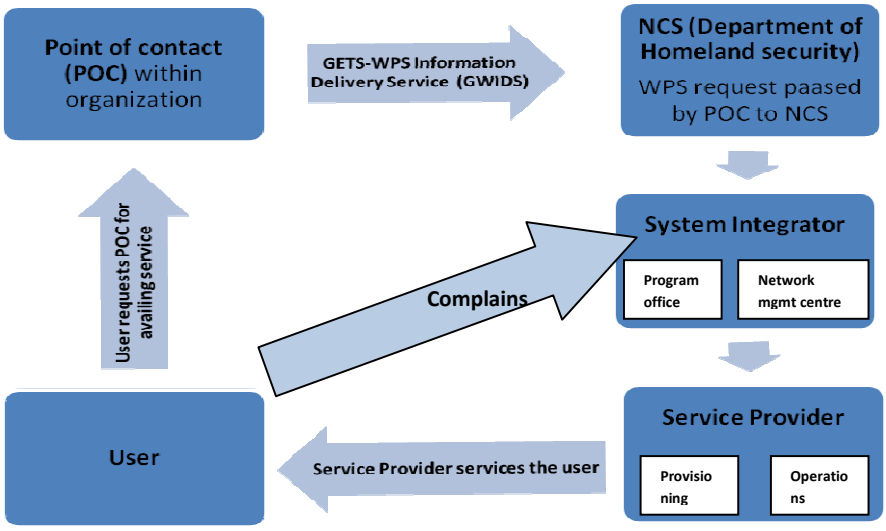
Real-time Processing Overload - 3



FCC approved the use of Access Overload Classes AOC and Advanced Signaling Priority for WPS in May 2010. This Enhanced Overload Performance (EOP) features address signaling channel congestion on access, processing and egress in extreme congestion situations in networks for WPS.

A.36 Current WPS implementation (Voice) is Second Generation (2G) based. However the development of the feature capability for NGN networks is in progress and likely to be fully deployed in the NGN networks in next five years.

A.37 The generic model for GETS and WPS service delivery to end customer is as follows –



United Kingdom(UK)

iii. **Access Overload Control (ACCOLC)**

A.38 Access Overload Control is a procedure in the United Kingdom for restricting mobile telephone usage in the event of emergencies. This scheme allows the mobile telephone networks to restrict access in a specific area to registered numbers only and is normally invoked by the Police Incident Commander (although it can be invoked by the Cabinet Office). The emergency services are responsible for registering their key numbers in advance. ACCOLC was replaced by MTPAS (Mobile Telecommunication Privileged Access Scheme) in 2009.

Mobile Telecommunication Privileged Access Scheme (MTPAS)

Purpose of MTPAS

A.39 The purpose of MTPAS is to restrict civilian access to cellular phone networks during emergencies. This actively prevents civilian usage from congesting the cell networks, thus allowing emergency services personnel priority for communications. It also serves to control information flow in and out of a declared emergency area in case of an incident. If networks become congested, handsets installed with a privileged access SIM will stand a much higher likelihood of being able to connect to their network and make calls than other customers. Special SIMs are only available to entitled users within the emergency services community and not to members of the public.

A.40 Mobile telephones work on a cell basis. In the United Kingdom, the cells adjacent to the incident are identified and MTPAS is implemented on those cells alone. MTPAS-aware telephones are allowed access to the

network and all other users will receive a fast beep (called a Fast Busy Signal). Once the call is connected to the network it is routed like any other call. If the user receives a recording that all lines are busy or engaged tone then it indicates that MTPAS is not being utilised.

A.41 As MTPAS can be a frustration to normal network users in case of network overload, in Britain it is normally only initiated after careful consideration. The authority of a British Police "Gold" is required (major incident control is named in three tiers in the UK, gold, silver and bronze, in accordance with the London Emergency Services Liaison Panel, a group responsible for creating best-agreed procedures for dealing with various emergency situations) after consideration with the co-coordinating group. The Police Gold Commander will speak to dedicated staff at the Mobile network operator, and this will be followed up by a specially designed fax message, in accordance with the Home Office Document "Process for the Management of the Mobile Telecommunications Privileged Access Scheme (MTPAS)".

A.42 The Police Gold Commander's pro-forma fax reads: "This message serves to advise you that a Strategic Command Group (SCG) is being established in response to a major incident in the UK. As a result of the incident, your network may experience an abnormally high concentration of calls. If your network becomes congested, your assistance is requested to provide customers with SIMs allocated to classes 12, 13 and 14 a much higher likelihood of being able to make calls than customers allocated to other classes.", and gives space for the Police to identify the geographic location of the incident.

A.43 Not all calling by regular mobiles is prevented. Calls to an emergency services number (911, 112, 999) will ignore all MTPAS or global action messages. MTPAS is a partnership of the Cabinet Office, Regional

Government Offices, Local Resilience Forums' Telecommunications Sub Groups (TSGs) and the responder community. It replaced ACCOLC in 2009, and during the crossover period SIM cards registered in the ACCOLC scheme continued to gain priority. The changeover to MTPAS was made in order to "devolve responsibility and management of the Scheme to the local level", "coordinate a common approach to the Scheme in England and Wales", improve the effectiveness by further limiting the number of users, and to "ensure clarity regarding activation of the scheme."

A.44 MTPAS is only available to Category 1 and 2 Responders (as defined in the Civil Contingencies Act 2004) and partner organizations which directly support them at the scene of an emergency incident.

A.45 The TSGs have responsibility for coordinating the Scheme in their local resilience area. Responder organizations which currently do not use privileged access SIMs for their staff's mobile phones are required to contact local TSG for information on how to join the Scheme. Every organization has a designated MTPAS Point of Contact. Some responder organizations work on a national basis, rather than locally. These organizations are coordinated by a central government department.

A.46 MTPAS devolves responsibility and management of the Scheme to the local level where there is better understanding of the requirements of local responder organizations entitled to be a part of the Scheme Objectives.

Activation Arrangements

A.47 The MTPAS access class may be indicated on the SIM card or in protected storage on the handset itself, by a set of numbers in the range 0 - 15 giving a total of 16 flag bits in the global action message. It is not

hierarchical so it can allow level 1 access while disallowing level 6 access. If the 16 bit control word is, 1010-0000-0011-1111 only phones with the MTPAS access level of 1, 3, 11, 12, 13, 14, 15 & 16 will accept request for placing a call. It is important to note that the decision whether to permit a call is not made by the cellular network but by the handset itself.

A.48 In Britain, ordinary cellphone users have numbers in the range 0 - 9. Higher priority users are allocated numbers 12-14. During an emergency, some or all access classes in the range 0 - 9 are disabled. If the overload condition continues, mobiles with access classes level 10, 11, then 12 and so on may also be disabled by the cellular network operator.

Cost

A.49 There are no costs attached to MTPAS: this is both for the provision of SIMs to an entitled organisation (in addition to the usual and agreed contract costs). Neither is there any remuneration for loss of service if network restrictions are necessary during an emergency response.

MTPAS 2-Way paging

A.50 In UK, for a long time pagers have been used by the emergency response community to reliably get messages to its staff. As of 2009, all 2-way pagers from Page One Communications that are in use by Category 1 and 2 responders are enabled for use with the MTPAS. These 2-way pagers are reliable means of communication that combine the speed, reliability and broadcast ability of paging, with auto acknowledgement and response functions and provide the following benefits to the responder organisation:

- Message Delivery Confirmation, which allows the organisation to know that the paging message has been successfully delivered;

- 2-Way Group Messaging, to see all individual responses to a group message.
- The reply status of the group is updated in real time and the group location information is displayed on a map.
- GPS (Global Positioning System), providing recent location information on every reply message.
- The individual user benefits from the ability to reply to a pager message via the mobile network.
- Recipients can choose from up to eight text based responses which can be chosen by the organisation.

A.51 The Cabinet Office has agreement with telecom service providers O2 and PageOne, for supplying all Entitled Organizations with 2-way pagers already fitted with MTPAS SIMs. While only Entitled Organizations can purchase MTPAS 2-way pagers, there are not the same restrictions about who within the Entitled Organization can be issued these devices nor are there any restrictions about how many of the devices can be used within an Entitled Organization. The reason for this is that the reply functions of 2-way pagers work over the mobile network and have very little impact on the overall level of traffic going over the network.

Over-the-air (OTA) provisioning

A.52 MTPAS has entered into an agreement with Vodafone by which mobile Network Service Providers (NSPs) can change the access of a SIM (from normal public access to privileged access and vice versa) remotely, also called over-the-air (OTA). Before this technology was available, all mobile devices with SIMs that had normal public access could only be given privileged access by physically changing the SIM, which was provided by the mobile NSP. An OTA change to a SIM's access is preferable to physically changing the SIM because it can be done quickly and easily

once the mobile Network Service Provider receives the request and means the user should not have their service interrupted while SIMs are changed over in their handset. Vodafone provide an OTA service and follow it up with a text message to inform the user of the change. All entitled organizations with MTPAS SIMs must deregister any privileged access SIM that is no longer required. This allows emergency responders who really need privileged access to the mobile networks to have it when it really counts.

Agencies involved in UK in response & recovery during emergencies

A.53 The main agencies and sectors that are likely to become engaged in the response to, and recovery from, emergencies at the local level in both England and Wales are :

Category 1 responders

- Police services
- Fire and rescue services
- Health bodies
- Maritime and Coastguard Agency
- Local authorities
- Environment Agency

Category 2 responders; and

- Utilities
- Telecommunications
- Transport providers
- Highways Agency

CANADA

A.54 In Canada, Industry Canada's Emergency Telecommunications team is responsible for emergency telecommunications planning, preparedness and response. Its responsibilities stem from the Emergency Management

Act and the Radiocommunication Act. In collaboration with federal and provincial governments and the telecommunications industry, Industry Canada's Emergency Telecommunications team**:**

- develops, maintains and executes emergency telecommunications plans;
- provides advice and assistance to mitigate and address the disruptive effects of emergencies on telecommunications;
- participates in the development of a national public alerting service;
- facilitates the movement of telecommunications equipment and services during emergencies, nationally and internationally;
- manages programs to help ensure the availability of essential telecommunications during periods of system overload or degradation; and
- manages programs to help ensure the continuity of telecommunications services for all Canadians.

A.55 Industry Canada's Emergency Telecommunications team works closely with federal and provincial emergency measures organizations and the telecommunications industry throughout Canada. Together, they develop best practices in emergency planning and foster important links within the telecommunications community. Through this collaboration, they develop national programs, establish mutual aid agreements and plans, and provide coordination assistance for emergency telecommunications in response to a crisis or disaster.

A.56 The major telecom operators in Canada, had been participating in the Priority Access for Dialing (PAD) program[17] on a voluntary basis and offering PAD free of charge. PAD provides dial tone to designated essential lines on the Public Switched Telephone Network (PSTN).

[17] http://www.ic.gc.ca/eic/site/et-tdu.nsf/eng/h_wj00016.html as accessed on 27th Feb, 2012

However, the Priority Access for Dialing program has ended as of December 31, 2010. But telcos continues to support Wireless Priority Service (WPS) which is system that is similar to WPS in USA.

Annexure-B

Various releases of 3GPP TS 22.067 enhanced Multi Level Precedence and Pre-emption service (eMLPP); Stage 1[18]

Release	Freeze meeting	Freeze date	::	remarks	SDO publications
R99	SP-05	1999-10-13	::	.	ETSI
	event	**version**	**available**	**remarks**	**click ref to download**
	SP-05	3.0.1	1999-10-13		DTS/TSGS-0122067U
Rel-4	SP-11	2001-03-22	::	.	ETSI
	event	**version**	**available**	**remarks**	**click ref to download**
	SP-10	4.0.0	2001-01-08		RTS/TSGS-0122067Uv4
	SP-15	4.1.0	2002-03-25		RTS/TSGS-0122067Uv4R1
Rel-5	SP-16	2002-06-13	::	.	ETSI
	event	**version**	**available**	**remarks**	**click ref to download**
	SP-16	5.0.0	2002-07-19		RTS/TSGS-0122067v500
Rel-6	SP-26	2004-12-16	::	.	ETSI
	event	**version**	**available**	**remarks**	**click ref to download**
	SP-18	6.0.0	2002-12-18		-
	SP-20	6.1.0	2003-06-18		RTS/TSGS-0122067v610
Rel-7	SP-35	2007-03-15	::	.	ETSI
	event	**version**	**available**	**remarks**	**click ref to download**
	SP-31	7.0.0	2006-03-23		RTS/TSGS-0122067v700
Rel-8	SP-42	2008-12-11	::	.	ETSI
	event	**version**	**available**	**remarks**	**click ref to download**
	SP-34	8.0.0	2006-12-14	early SDO publication for referencing in ITU-R M.1457	RTS/TSGS-0122067v800

[18] http://www.3gpp.org/ftp/Specs/html-info/22067.htm

Rel-9	SP-46	2009-12-10	::	Upgraded from previous Release without technical change .	ETSI
	event	**version**	**available**	**remarks**	**click ref to download**
	SP-46	9.0.0	2009-12-20	Automatic upgrade from previous Release	RTS/TSGS-0122067v900
Rel-10	SP-51	2011-03-23	::	Upgraded from previous Release without technical change .	ETSI
	event	**version**	**available**	**remarks**	**click ref to download**
	SP-51	10.0.0	2011-04-08	Automatic upgrade from previous Release version 9.0.0	RTS/TSGS-0122067va00
Rel-11	SP-57	2012-09-12	::	. .	ETSI
	event	**version**	**available**	**remarks**	**click ref to download**
	SP-53	11.0.0	2011-10-03		RTS/TSGS-0122067vb00

Genealogy of this spec:

antecedent(s)	this spec	descendant(s)
02.67	22.067	(no descendants)

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Annexure-C

NDMA's suggestions on organizations and their levels of priority for implementation in India

Priority-I: (Executive Leadership)

- Hon'ble Prime Minister and officers of PMO upto JS level
- Union Home Minister and all other Cabinet Ministers
- Vice Chairman and all Members of NDMA
- Cabinet Secretary
- Home Secretary
- Secretary MOES, Secretary MEA
- Members of NCMC and NEC
- All Chief Ministers
- UT Administrators
- All Chief Secretaries
- Chiefs of Army, Navy and Air force in addition tone Operational Head in each force
- Secretary (BM) & JS (DM), MHA
- AS & JS Cabinet Secretariat
- Secretary and all Joint Secretaries of NDMA
- NDMA Control Room
- DG (NDRF) and IG (NDRF)
- DG IMD
- Dir INCOIS Hyderabad
- Chairman, CWC

Priority – 2: (Disaster Response)

- All Ambassadors to India
- State Emergency Operation Centres
- All Members of SDMAs
- Secretary/Commissioner, DM/Relief at State Govts.
- All District Collectors/District Magistrates
- All Members of SECs
- Regional Heads of Commands of Army, Navy and Airforce
- All DGs (Police) of State Level
- DGs of Para Military Forces
- DG (Fire Services)

- DG (Health Services)
- Relief Commissioners and Secretaries, State DM Deptt.
- Chief Conservator of Forest
- State Heads of IMD
- DG, Civil Defense
- DGs Home Guards
- All Directors of NDMA
- DIG (NDRF) & Commandants of NDRF Btn.

Priority – 3 : (Emergency Support Services)

- All major hospitals (Five Hospitals in each metropolitan city and three hospital in State Headquarters and two hospitals in district headquarters as identified by DG (Health).
- Police Control Rooms
- All Fire Stations
- Red Cross Emergency Communication System Officers
- Urban local bodies representatives/Municipal Commissioners
- Transport Commissioners
- Chief Engineers of PHE & PWD
- DRM
- Chief General Manager of Govt. owned Telecommunication operators

Priority- 4: (Public Services & Welfare)

- All Members of DDMAs
- State level In charge of FCI
- PIB & PTI local heads
- UN Organizations
- Prasar Bharti correspondents

Priority – 5: (Disaster Recovery)

- Education Departments
- Scientific Organizations
- State Project Officers of various flagship
- Schemes of the Govt.
- Damage assessment team members
- NGOs
- Identified Structural Engineers
- Urban planning and development agencies

As recommended by CSs/DCs/DMs