CONSUMER PROTECTION ASSOCIATION

HIMMATNAGAR

DIST. : SABARKANTHA

GUJARAT

Consultation Paper
On

'Next Generation Public Protection and Disaster Relief (PPDR) communication networks'

Introduction :

Natural disaster reported to have occurred increased dramatically over the second half of the 20th century. Floods, earthquakes, tsunamis and storms have appeared worldwide with catastrophic events. The number of people affected by these disaster and the associated economic costs have increased dramatically. Natural disasters impact developing and developed countries in different ways, with greater number of people being killed and affected in developing countries and greater economic cost being experienced by developed countries.

The occurrence of natural catastrophes is on the rise, driven by factors such as climate change, increased seismic activity and exacerbated

by man-made problems such as deforestation, illegal logging, lack of building standards enforcement, etc..

According to the World Bank Natural disasters are becoming more costly: in constant dollars, disaster costs between 1990 and 1999 were more than fifteen times ($652 billion in material losses) than they were between 1950 and 1959 $38 billion at 1998 values. Ref. : (http://www.worldbank.org/ieg/naturaldisasters/docs/natural_disasters_evaluation.pdf)

There is recurrent risk of major public safety disaster, such as a terrorist attack or a catastrophic fire or an epidemic and the growth of cyber terrorism as a new era problem that could shut down vital infrastructure such as utilities, financial and commercial network and cyber crime of all kinds. There are many aspects of PPDR work from street observations by on duty police to surveillance operations to pain staking deductive analysis of crime data, but each step broadband applications are coming to play a vital role in enhancing the effectiveness and efficiency of such work.

The demand for communication services explosively increases, while communication resources are often affected entirely or partially. Without a working communication infrastructure, the coordination among numerous disorganized helpers and rescue teams is impossible. There should be a wireless disaster network, integrates network functions which offers a large number of possibilities to optimize a disaster network, such as availability, reliability , cost efficiency, scalability, lower power consumption and adaptable network configuration and topology.

ISSUES FOR CONSULTATION :

Q1. Do you consider the existing fragmented model of PPDR communication network in the country adequate to meet the present day challenges? If not, what are the deficiencies in the existing model of PPDR?

Comments :

The existing fragmented model of PPDR communication network in the country is not adequate to meet the present day challenges. For public safety communications, we must look beyond routine communications use to ensure that there is sufficient capacity available when major emergencies occur.

In disaster situations, an operative communication infrastructure is essential, in order to rescue victims and organize, coordinate and support rescue teams. Existing communication infrastructures are often affected in case of disaster, so that the infrastructure is damaged in whole or part. Consequently, the necessity occurs to develop a proper communication system. This system should be enabled to be established rapidly, easily and cost effectively in order to share information inside and with the disaster area constantly and robust. Moreover, desirable system provides not only voice communication but also multimedia communication to support the rescue teams and helpers sufficiently.

To overcome the challenges in disaster networks, the concept of network functions should offer numerous new approaches to optimize

availability, redundancy, reliability, reparability, recoverability, efficiency and robustness of communication infrastructure in disaster situations.

Fast, efficient and secure communications are a basic requirement of first responders such as the police, fire and ambulance services, civil defense forces, border guards, armed forces search and rescue missions, etc.. To alert them to impending or actual danger to the public: the speed of response is crucial.

- To provide information in sufficient detail as to allow them to identify the nature of the problem and respond accordingly: information is often partial, not always accurate, and requires further confirmation.
- To ensure that the communications have not been intercepted, altered or blocked in any way: if information is blocked or altered in some way the response is compromised, and if criminality is involved then interceptions can alert the suspects
- To enable first responders to communicate with complementary services to maximize the comprehensiveness and efficiency of the response: a relatively minor event may still necessitate police, fire and an ambulance service, whereas a catastrophic event will require a large-scale mobilization of civil defense services during which the scope and clarity of communications become crucial
- To enable fast and efficient communications between command centers and field operations and if necessary directly between field operators: not only is timely information important but in the event of damage and interruption to communications networks there needs

to be redundancy in the system and ways to maintain all-round field contact

- To communicate the alert to civil authorities and to issue warnings to the public: the dissemination of accurate information, warnings and advice to civil authorities and the public is especially crucial during catastrophic events such as widespread flooding, earthquakes, chemical explosions, terrorist attacks, etc..

Public networks such as 3G+ and 4G LTE systems that enable streamed video and image transfers, and social media networks that can spread warnings within minutes are important auxiliary modes of communications for first responders and absolutely helpful for the rapid dissemination of public information such as warnings. However, during major disaster situations such as catastrophes, public networks are quickly degraded with traffic overload. There is also little direct control over the accuracy of the information being spread over social networks and important, urgent and accurate information can get crowded out. An additional threat in the future could be the use of distributed denial-of-service (DDoS) attacks by terrorists against IP-networks such as 4G LTE prior to carrying out an act of terror, thereby depriving a PPDR network of auxiliary support.

The use of broadband connectivity speeds is applicable to both PP and DR, and it is an underlying assumption is that in the future faster speeds will be needed to take full advantage of new network technologies and applications. The most compelling examples of applications requiring higher speeds are those based upon real-time and high-speed video links,

high-definition imaging and fast access to 'Big' data analysis. Examples of real-time streamed video would be the use of cameras mounted on robots sent into hazardous environments to send back information to first responders in cases such as fires in dangerous chemical plants or oil refineries or in terrorist or hostage situations.

The Mumbai Bombing, 2008 :

"The 60-hour terror ordeal that struck Mumbai on Wednesday night caused a blow of nearly Rs 4,000 crore to the financial capital of the country, as per theindustry experts. "It is an overall loss of the economy as hotels, shops and all businesses were closed. A minimum of Rs 1,000 crore per day is lost when such a shut-down takes place," Assocham Secretary D S Rawat said. "If you take the impact for four days due to the siege, then the overall loss could be over Rs 4,000 crore," he added.
(**Source:** http://articles.timesofindia.indiatimes.com/2008-11-29/india-business/27921761_1_mumbai-terror-attacks-commodity-exchanges-financial-capital)

Another example would be identifying the number plate on a suspect moving vehicle or a suspicious face on a surveillance camera which could then be automatically referenced back to a database of biometric details and other identification metrics. The reference back to a database may be assisted by very high speed 'Big' data search: what could be called 'security analytics' comparable to the growing use of 'business analytics'.

How far broadband-enabled PPDR services would be able to go in reducing the risk of such losses itself remains a judgment call by specialists and experts in the field, but the qualitative evidence strongly supports the view that :

- There are many cases in which broadband-enabled applications would greatly increase the effectiveness of PPDR agencies

- The fast accelerating trend within society is towards the adoption of broadband access, devices and applications, not least among the more organized criminals and terrorist groups, the significant increase in cybercrime being evidence of this as well as the use of video links and the Internet for surveillance of targets by terrorists. To be effective in meeting these challenges PPDR agencies need to keep abreast of these developments.

Challenges in communication networks for disaster operation :

The impact of natural disasters on communication infrastructures leas to poor communication and co-ordination of disaster response workers and insufficient information. A working communication system is crucial to disaster response. Hence, a disaster network should be constructed rapidly to provide communication services in disaster areas. Due to the fact that communication network is essential for disaster response, a large number of challenges arise. The PPDR Model should have :

1. Popularity : Newer technology is user friendly and easy to use.

2. Usability :

To process usability, a disaster network should provide task oriented communication services. (e.g. Push to talk), support mobility (e.g. Small, light devices) and has adequate quality of services. Besides, the resources of disaster network should have long durability, which may be realized by rechargeable batteries. Therefore efficient utilization of power is required.

3. Practicability :

The network should be constructed under limited budget as easy as possible within shortest time, also the equipment has to be easily accessible.

4. Capacity :

Support sufficient number of concurrent users and overcome traffic congestion.

5. Sustainability :

The communication network should operate until the public network recovered and it should continually provide service, even if it is broken down, it should recover quickly.

6. Adaptability :

Cause constantly changes due to aftershocks, fires and progress of disaster response etc., the communication system should be adaptable and flexible.

7. Operability :

Operation, administration and maintenance functions are needed to keep the system running, adjust network topology, and allocate bandwidth according to the requirements of the user groups, e.g. response workers.

8. Connectivity :

Communication among different user groups, such as rescue team members, head quarters and victims has to be guaranteed, which represents inter and intra communication.

9. Security :

Security functions should protect the network, also against attackers. In addition, high reliability and availability is necessary.

Q2. In the various models described in para 2.11-2.15, in your opinion which of the model (dedicated, commercial, hybrid) will be more suitable for Indian conditions? or Is there any other alternate model which would be more suitable for Indian telecom environment? Please provide rationale for the suggested model.

Comments :

Dedicated.

1. In different countries the needs and requirements will be different, but common to all is the desirability of strengthening public safety first responders.
2. It would seem common sense to harmonize the allocation of spectrum across the country to achieve economies of scale and a high degree of cross-border interoperability for public safety issues that cut across borders, such as natural disasters, search and rescue, anti-terrorism, etc.
3. A minimum spectrum band for a dedicated broadband PPDR certainly seems justified on the basis of the opportunity cost argument.
4. There will be periods of time when a dedicated broadband PPDR network will have unused capacity. We should examine the possibilities of spectrum sharing.
5. Whatever band of frequencies are allocated to PPDR services, whether on an exclusive, a primary or a shared basis, they should be able to accommodate a sequence of communications from voice to applications requiring either wideband or broadband.
6. It should be noted that if the spectrum is encumbered in any way by regulation to be shared with PPDR agencies in times of emergency, this will reduce the value of the spectrum depending upon the scope and detail of the encumbrance. This implies that sharing arrangements will reduce auction revenues below their forecast unencumbered commercial value, weakening the economic argument against, or strengthening the economic argument for, an allocation to PPDR agencies.

7. Any regulation that induces operators to do things or restrain them from doing things will by definition reduce their potential profitability and therefore the value they will bid for spectrum. If the regulation did not have this effect it would not be necessary as the operators would do according to their own self-interests. The justification for such regulation is that it will bring greater benefits to a wider community.

Q3. Should PSUs be earmarked for providing nationwide broadband PPDR communication network? Please justify your answer.

Comments :

Broadband spectrum for a dedicated PPDR network outside of emergency situations could be shared on a commercial basis with non-PPDR users as an incentive to the efficient use of spectrum.

On a cost-benefit basis the opportunity cost is insufficient to justify market-based assignments of spectrum for PPDR purposes. This is not to argue that there should not be some form of spectrum pricing to encourage the most efficient use of the spectrum, nor to argue against the possibility of incentive pricing to encourage PPDR agencies to share frequencies during non-emergency periods. But this sharing arrangement could be based upon the assignment of the spectrum to PPDR agencies and not to commercial users. If PPDR agencies have unused spectrum during non-emergency periods there would appear to be an economic

argument in favor of their right to manage the leasing of the spare capacity.

The FCC recommended that networks should be privately-owned by mobile service providers and capacity made available to PPDR agencies at times of emergency. Security firewalls and guard-bands may be required, but the advantage is a network that has the architecture appropriate to the needs of PPDR.

Q4. Will it be technically feasible and beneficial to permit PPDR trunking service roaming on public telecom networks? If yes, what challenges do you foresee in implementation of such an arrangement? Please justify your answer.

Comments :

For the rare times when additional capacity is actually needed, such as when the public safety network is not available, the authority should recommends that public safety have roaming and priority access on commercial wireless broadband networks. This will provide a safeguard to ensure that public safety has access to multiple, redundant networks with significant additional capacity when it is needed. Further, the public safety community can enter into additional spectrum sharing arrangements with other commercial partners. In these scenarios, it is likely that in extreme emergencies with heavy video or other high-bandwidth requirements, far more capacity will be required.

The Authority should plans to begin a rulemaking that will result in the implementation of the priority access and roaming regime in the near term. LTE technology is particularly promising with regard to priority access and roaming. As part of its current standard it allows network operators to assign different priority levels to different users or services, such that low-priority users have restricted use of network resources. Moreover, with IP (Internet Protocol) and LTE technology, it is possible to prioritize traffic in a way by which capacity is transferred to the highest and best use. Such prioritization schemes have been used successfully in military systems. The LTE standard is bringing these capabilities to wireless cellular systems.

Public safety users should be able to roam and obtain priority access on commercial broadband wireless networks. Coverage and capacity of the public safety broadband network should be supplemented through in-building systems and through provision of deployable cell sites and vehicular relays.

The Effect of Interference :

Adjacent cell interference can also impact the capacity of a wireless network. However, the use of advanced RF engineering techniques in combination with LTE technology can greatly reduce potential interference problems.

Video uplink speed :

The PPDR broadband network should have sufficiently support each video device, which should be enough to carry standard-definition television (SDTV) and high-definition television (HDTV), respectively.

Q5. Can frequency bands be identified exclusively for public protection and disaster relief? What are the candidate bands for PPDR operations in India?

Comments :

Capacity depends on factors such as architecture, technology, and the number of sites, as well as amount of spectrum.

The FCC has advocated the adoption of cellular architectures by PPDR agencies and the use of LTE technologies to increase spectral efficiency as well as to bring down costs and ensure interoperability with commercial networks.

Due to advances in network management using a range of efficiency-enhancing technologies and architectures, and in compression techniques, especially of stream video, the award of 10MHz to 20MHz for broadband PPDR services is Sufficient. Priority access and roaming onto commercial bands can provide public safety with far more capacity during periods of greatest need.

Q6. If wideband/broadband PPDR is to be implemented in India, what quantum of spectrum will be needed for such solution for PPDR?

Comments :

The allocation of spectrum must allow for the adoption of broadband technologies and standards, the bandwidths required are not allocated on

the basis that all or even most of the communications are quintessentially broadband in nature.

This is not meant to preclude the continued use of narrowband and wideband frequencies at different bandwidths. These are not only a backup safeguard against non-availability in times of emergency, they would also be compatible with an incentive pricing model that allows PPDR agencies to lease out broadband spectrum when not in PPDR use.

There should be a comprehensive plan to provide the public safety community with the capacity, performance, nationwide coverage, interoperability, technological growth and affordability required for reliable, nationwide, interoperable broadband communications.

In these scenarios and past public safety broadband experience, the most demanding application with respect to capacity is likely to be high-data-rate applications such as mobile video. In order to support the potential for video demands during times of emergency, it is important to look first at sound spectrum management policies that ensure that capacity is properly allocated among users and available networks and technologies.

Q7. What is the cost and benefits tradeoff envisaged for public protection and disaster relief viz-a-viz commercial value of spectrum?

Comments :

1. The decision to allocate a scarce resource to any service can be taken on a variety of different grounds, but they all imply an economic

outcome of some sort. A decision taken on grounds of "public interest" is equally as legitimate as one taken on grounds of "commercial interests", but whereas "public interest" is unequivocal in setting the priorities, "commercial interests" imply a belief that public and private interests are compatible and can work in harmony. In an ideal world, if and when an emergency situation arises, private commercial interests would give way to over-riding public interests, for example, network capacity for PPDR services would be prioritized. In practice this may prove difficult to achieve, and impossible if the network is down. In this regard, the prior decision to invest in network capacity, in secure locations and in the required geographical areas will prove to be of crucial importance, and these investments may not be the ones a commercial operator has any self-interest in undertaking. Nevertheless, an informed policy decision one way or the other can be assisted if the economic implications of the decision are fully recognized and understood.

2. Placing a value on loss is not an exact science. The loss assessments are estimations made by various agencies and organizations coming at it from different perspectives and based upon a number of different factors. One factor that will influence valuation is the *per capita* GDP of the country affected. In wealthy communities personal lifetime earnings will be higher and property values higher, so a loss assessment based upon the insured values or upon loss of lifetime earnings will inevitably appear higher than in a poor community. This

also means that over time the valuations placed upon losses of the same physical magnitude could rise.

3. All networks are designed to meet certain busy-hour peak loading conditions, which means that unless there are some sharing arrangements of unused capacity during off-peak hours there is bounded capacity available for traffic surges. Where PPDR services are using dedicated networks the same issue arises, but without the same regularity of event frequency. Major floods or fires are not daily "busy hour" events, although for some types of public safety events, such as traffic accidents, there is a greater likelihood of occurrence during certain times of the day or night. Provisioning for these surges or "spikes" in traffic inevitably adds to the cost of providing adequate PPDR coverage for a territory. It is rather like accident or health insurance, it is a cost that the insured person hopes they never have to claim back, but the potential costs should a major accident or health problem occur outweigh the costs-saved by not having it. The World Bank has pointed out that natural disasters such as floods and landslides can wipe out years of donor aid money to less developed countries spent on schools and hospitals and roads within a matter of days.
4. The cost benefit approach will differ according to economy due to its level of risk.

5. The *per capita* losses sustained by society will greatly outweigh the auction revenues plus consumer surplus that would arise from assigning the spectrum to 4G LTE operators.

6. On a social cost-benefit basis the benefits of assigning broadband spectrum to dedicated PPDR services on an exclusive basis far outweigh the costs as measured by opportunity cost.

7. There is justification on a cost-benefit basis for allocating the spectrum that is considered sufficient for national needs. The decision would need to be based upon a realistic assessment in the country of what contribution broadband would make to reducing the risk of loss.

Q8. Do you suggest any other workable option that can be adopted?

Comments :

In FCC's National Broadband plan, The cornerstone of the NBP's public safety recommendations is the utilization of 10 megahertz of dedicated 700 MHz spectrum, currently designated by Congress for public safety use. In order to exploit this asset, the NBP recommends that this spectrum be utilized by public safety agencies through the creation of incentive-based partnerships with commercial entities, such as 700 MHz broadband service providers, to construct the public safety broadband network in a cost-efficient manner by leveraging commercial technologies and infrastructure, with the support of public funding.

Q9. Please give your comments on any related matter not covered in this consultation paper.

Comments :

1. It would be a mistake to design a network based upon the public safety's past experience in using spectrum. Public safety agencies do not have significant incentives to use spectrum efficiently, because, unlike commercial entities, public safety agencies may not pay for spectrum. Accordingly, using spectrum inefficiently is not a cost. However, constructing adequate infrastructure is a cost even when that cost would result in improved communications and reduced costs over the long term. Nevertheless, both spectrum and infrastructure are costly.

2. PPDR agencies need to have in place professional spectrum management teams who are familiar also with the applications, their bandwidth requirements, traffic routing, interoperability and interconnection capabilities, devices and their application interface protocols etc., to manage the network in times of both emergency and non-emergency. In other words, a decision to award broadband spectrum to PPDR agencies should be seen at the same time as an opportunity to upgrade their human resources and organizational capacities.

3. If they do not already exist, PPDR technical committees with representatives of network operators, equipment suppliers, software applications developers, etc., could be established as a resource of technical information to keep PPDR agencies fully aware of

technological and other relevant developments within the field of public safety.

4. Possible Future Capacity Expansions :

It is also important to ensure that there is room for expansion and growth.

5. There is a Need to study Indian Population Growth and traffic load.

From the above study it may be concluded that:

1. The annual occurrence of serious threats to public safety including catastrophic events seems to be on an increasing trend.
2. The loss of lives, property and damage to the made-man and natural environment as measured in economic and insured terms are increasing.
3. The Asia Pacific region seems to be the most vulnerable.
4. It is reasonable to speculate that the public's "willingness to pay" increases as the perceived risks and the potential losses increase.
5. The economic value of PPDR services increases if they become more capable of reducing the public safety risk and losses.
6. Providing PPDR agencies with broadband capabilities is likely to increase their capacity to reduce public safety risk and losses.

THANKS.

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President