



Public Safety and Disaster Response White Paper – April 2017

Mission critical communications must *always be on* to enable quick response to a catastrophe. Humanitarian disasters and the necessary quick relief to save lives require fast, secure and reliable communications to be established immediately in the affected area, regardless of the state of existing infrastructure often damaged in such events. Such communication is necessary for the execution of both immediate and follow up aid efforts.

For effective deployment of aid during and after disasters, agencies must work together and precisely coordinate their cooperation. Successful operations by first responders depend on timely and efficient communication among relief workers, donors, affected communities and their agencies. A pressing need exists for a flexible, high performance wireless communication infrastructure that can supersede damaged local networks and meet increased demands arising in and around natural and man-made disaster situations.

First Response

The realities of disaster situations are unknown and often fluid. There is little time to waste and even while the situation is being evaluated, first responders often must act immediately despite potential additional dangers that lie ahead. In those circumstances, constant vigilance and an accurate, real time Common Operational Picture (COP) can mean the difference between life and death.

No matter the nature or scale of a disaster, the first thing that happens during a crisis is mass deployment of first responders:

- Civil Government Forces (Police, Ambulance, Firefighters, HAZMAT, National Guard, FEMA and other related agencies)
- Homeland Security and Home Front Command
- Search and Rescue (SAR) teams, human and Unmanned Ground and Aerial Vehicles (UGV/UAV)
- Administrative NGOs and humanitarian agencies
- Ad-hoc Command and Control (C2) deployment to orchestrate and coordinate efforts

All involved agencies and responders, regardless of municipal or even national affiliation, must be able to communicate with one another, with other agencies, and most importantly with the governing command and control headquarters orchestrating the efforts. Establishing mission critical communication to facilitate the sharing and transmission of real-time accurate information is a must!



Unfortunately, when disaster strikes, terrestrial communication networks are often damaged or rendered inoperable. Hurricanes, floods and seismic activity destroy vulnerable communications equipment, such as base transceiver stations, fiber optic lines, wireless links and transmitters.

Even where physical damage is limited, incumbent terrestrial communication systems often cannot cope during disaster. These networks are typically designed for commercial customer use, and in an emergency cannot handle the enormous quantities of information overloading the network, including increased public use that can overwhelm networks that remain intact. This has occurred repeatedly over the years – Hurricane Katrina, Super Storm Sandy, Typhoon Haiyan in the Philippines, the Tsunamis in Japan and the Indian Ocean, earthquakes in Haiti, Pakistan, Nepal and China, among many others.

The Challenges of First Response: Lessons from Israel

Moshe Levinson, SVP Business Development and Special Ventures, Beeper Communications, Israel, has summarized the challenges his company set out to address in responding to disaster situations:

During disaster response situations, communications are often unreliable or may not be available at all. Re-establishing reliable, real-time communications is essential to any coordinated response. This is not only to enable mass public alert, but more importantly, to maintain reliable communication between those responding, and those coordinating the response efforts. We must keep our first responders safe and ready even when we are not yet certain of the magnitude of the crisis or whether it is even over”

When terrestrial networks break down, some obvious challenges arise:

- Relief agencies and Search and Rescue teams cannot communicate, preventing them from doing their job effectively
- Communications, transport, power and computer systems are severely disrupted, preventing relief workers from accessing necessary tools and information
- Chaos ensues as the public is unable to communicate in order to get vital situational awareness information
- Remaining communications infrastructure is overloaded, unreliable and often fails

In an emergency situation, there is seldom time to repair costly BTSs (Base Transceiver Stations) or fiber infrastructure. Satellite is an obvious fallback, but has associated latency issues, and some responders and areas around the globe are not equipped to utilize this fallback technology immediately.

Perhaps most importantly, coordinating communications between varied groups of individual responders, who may not have coordinated prior to the event, presents a unique challenge, imperative for disaster response and saving lives.



Beeper Communication has developed a multi channel solution leveraging available cellular, wifi and even satellite frequencies; any remaining (post disaster) infrastructure in a *hybrid approach*. Beeper's SD WAN Cellular bonder can intelligently interface multiple available frequencies on terrestrial networks, which are still functioning, even leveraging these together with satellite, providing instant ad-hoc networks for first responders regardless of the user equipment (UE) they may have.

Organizing Communications for Disaster and Emergency Responses

Responding agencies must be able to disseminate emergency alert and warning messages to the affected communities. Wireless links can be cut off by bad weather and line of site issues that accompany many terrestrial RF solutions. Transmitters themselves may be damaged or they may no longer exist. These issues create a myriad of challenges for the public and the rescue efforts, and for those orchestrating these efforts.

Here again, there are the challenges caused by network congestion. In the chaos of a disaster, the public's use of the network also becomes chaotic. The public trying to communicate all at once, can quickly overload any network equipment left functioning. Individual network "pipes" (individual carrier BTS' and other cells) often become congested with exceptionally high levels of voice, video and data traffic. With today's streaming video technology and smart phones, all the pictures and videos that people on the scene are trying to share only make matters worse for the existing commercial networks, which are designed just to "flow" data traffic, not analyze or prioritize it.

Having the ability to take control, monitor and manage bandwidth allocation is key to calming network chaos and bringing order to rescue efforts where first responding agencies must have the required capacity and access to enable them to handle the situation.

In an emergency, these commercial networks must be instantly "re-trained" and controlled in order to prioritize the most important information and to ensure that the most essential information is being sent and received in real time by those who need it most: data, video and voice. Beeper's SD WAN technology uses cellular aggregation, link bonding, load balancing and redundancy to achieve the utmost efficiency, while still leveraging the remains of a damaged terrestrial infrastructure. Being frequency agnostic, the **IE-5000** Multi-WAN channel bonding device can intelligently assess the network and remaining configurations in order to optimize the transport of all data, video and voice. The device also load balances frequency capacity while analyzing the network, and can determine the best and most reliable paths for transmit and receive (TX/RX) - on the fly.

Limit Network Vulnerability – Hybrid Solution

To meet the challenges faced by terrestrial networks in times of crises, Beeper's solution allows the establishment of an instant hybrid network. Remote areas with no infrastructure or damaged networks may demand satellite backhaul, but once communications are on the ground in real time, the ability to manage transmission and to control essential remaining network capacity is key for the public good – and most importantly, it is critical to the functioning and wellbeing of first responders.



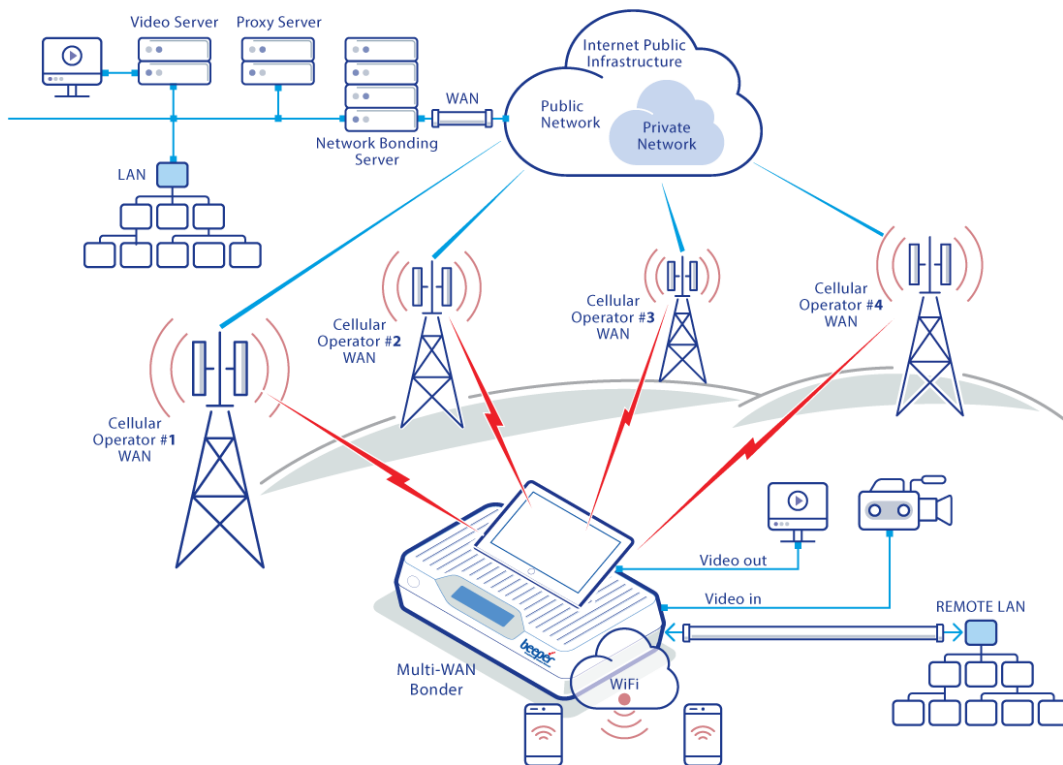
The **IE-5000** Multi-Wan Channel Bonder has the ability to intelligently analyze, and utilize, any existing network equipment that is still functioning. Bandwidth and capacity management for all necessary users is enhanced using deep packet inspection (DPI) further optimizing existing capacity. The **IE-5000** Cellular Bonder makes use of the most immediate and available network and allows management of the traffic passing through a bonded and secure Virtual Private Network (VPN.) In doing so, the allowed users (First Responders) and the Network Operations Center (NOC) have real-time reliable and redundant communications when no others may seemingly exist.

It is critical for local governments, law enforcement and emergency workers to have access to a secure, reliable wireless communications network that is not dependent on fully functioning existing terrestrial infrastructure or proprietary equipment – and it must be available at all times. Beeper solutions meet these requirements.

Summary

Aid agencies and critical communication providers have realized that communication across a group of diverse users and first responders is quite challenging, particularly during times of crisis. The ability to ensure successful, speedy and reliable deployments during crises, hinges on preparedness and contingency planning. Achieving this across multiple agencies with different legacy systems and communication providers can be a time consuming and challenging process that is sometimes overtaken by events. The Beeper SD WAN solution helps overcome interoperability challenges in minutes.

The **IE-5000** provides a Software-Defined Wide Area Network (SD WAN) for broadcast-quality mobile video, voice and data solutions that go live instantly, anytime, anywhere and on any existing network. The IE-5000 Multi-Wan Channel Bonder is the latest Multi-WAN channel bonder in the family along with the IE-4000 and the IE-2000 which provides mission critical high speed connectivity comprised from 3G/4G/LTE, SAT, LAN and/or WiFi WANs using its multi-channel bonding software. The technology leverages existing public infrastructure and bandwidth capacity, in order to create private secure and reliable networks for first responders.



Public Infrastructure Private Network

For over a decade, Beeper's solutions have been used daily within military, mission-critical and law enforcement agencies, as well as within civilian and private sectors. The Company operates a highly reliable independent wireless communication infrastructure based on combined satellite and ground RF transmission systems, providing comprehensive and reliable coverage. The company's Broadband Wireless Network products rely on advanced and unique mesh and MIMO algorithms, combined with proprietary, revolutionary and emerging technologies. Beeper's technological innovations impact all of their protocol layers and have resulted in highly proficient products.

The **IE-5000** seamlessly provides flexible networking services for any hybrid enterprise network requirement, without upgrade to existing infrastructures. It is a highly advanced software platform embedded in common off the shelf (COTS) hardware that is fully backwards compatible with any network.

Use **IE-5000** when there is no network infrastructure:

- Communicate between multiple interacting agencies
- Communicate one-on-one with stationary or mobile devices in the field
- Manage remotely
- Stream video to a specific and prioritized group of participants
- Access a public or private network, whether connectivity needs are a one-off or a regular event



With Beeper solutions, response time and real time data transport is dispatched securely through an array of messaging delivery methods. Utilizing cutting-edge and proven technologies, Israeli Emergency Protocols and knowhow, Beeper stands at the frontline of Homeland Security and public safety and is ready to interface with any other technology.