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Hearing on "Understanding the Power of Social Media as a Communication Tool in the Aftermath of Disasters"
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Chairman Pryor, Ranking Member Brown, and Members of the Committee.

Thank you for your focus on the important issue of crisis response and the central role that technology now plays in disaster relief and recovery. During the past year, tens of millions of people around the world have suffered through natural disasters such as earthquakes in Haiti, Japan, Chile, China, and New Zealand; floods in Pakistan and Australia; and forest fires in Israel. Our own citizens have faced crises, with tornadoes and floods causing terrible damage in recent weeks reminding us of the toll natural disasters have on human life. Our thoughts are with the communities that have just been hit by devastating tornadoes in Alabama and across the US.

As the Senior Vice President of Google.org, the philanthropic arm of Google, which includes the team that responds to natural disasters around the world, I have seen the increasing importance of Internet-based technologies in crisis response. Our team has used search and geographic-based tools to respond to over 20 crises in over 10 languages since Hurricane Katrina, and we have already responded to more crises in 2011 than we did all of last year. In the aftermath of the devastating tornadoes in Alabama last week, we supported the Red Cross by providing maps that locate nearby shelters, updated satellite imagery for first responders, and directed local users searching for "tornado" or "twister" to the maps through an enhanced search result.

Our work is modest in comparison to the work of emergency relief organizations and governments that are called to action, and our team does not claim to be expert in crisis response. We are computer scientists and developers, and Google.org is a newcomer to this space. We are still learning how we can help to respond to different types of crises. But our experiences have given us a unique vantage point on how powerful and robust a resource Internet-based technologies can be for both emergency responders and affected populations as they prepare for, respond to, and recover from a disaster. Here's why:

First, the Internet often remains available when other networks fail. The Internet was designed to be robust in the face of outages, and to automatically reroute through the path of least resistance. Its openness and interoperability continue to enable communication and access to information even when disasters render other means of communication unavailable. As a result, Internet-based emergency tools have proved to be quite reliable in disasters.

Time and time again, the Internet has served as a medium of communication when voice and text services are overburdened. Even when there is no power to boot up a computer, people are able to access the Internet through mobile devices to find emergency information or share their whereabouts.

Second, simple Internet technologies are often more effective than purpose-built technologies in emergencies. Google's products were not built as emergency-response tools, but we've found that they can be helpful in disasters. In emergency after emergency we see use of Google Search spike dramatically in affected areas, led by searches for information ranging from the status of loved ones to trustworthy information. Gmail and other Internet-based services like Google Maps are the tools of choice for many emergency responders who must be able to access email and documents anywhere in the world using whatever kind of operating system or connectivity they find. And Google Maps allows many response organizations to determine where to allocate resources. Organizations may, for example, use a familiar tool like Google Maps to make sure they set up their clinic next to a refugee center. This is because these technologies are simple, use common standards, and allow for open access.

Third, the Internet scales and allows different devices and applications to work together. The Internet Protocol has scalability at its core. This means that when demand increases to exceptional levels in an emergency, the Internet can handle it. Other communications networks are engineered with normal use patterns in mind and become overwhelmed quickly when these expectations are upset by disaster. The Internet Protocol also has openness in its DNA. An array of devices, using untold numbers of different applications, can all work together because of the way the Internet was built. These two strengths mean that the Internet allows tools created in response to one emergency to be rapidly iterated to fit the needs of a different emergency. For example, it took Google only 72 hours to create the Google Person Finder after the earthquake in Haiti. We managed to push the tool live just 90 minutes after the earthquake hit in Japan and made over 22 improvements to the tool during the crisis. This level of rapid iteration is something that is unique to Internet applications.

With these advantages of Internet-based technologies in mind, I would like to discuss the impact of three Google projects in recent relief efforts around the world: (1) Google Earth/Maps, (2) Person Finder, and (3) our efforts to make relevant news and information more readily available, such as through Crisis Response Landing Pages and enhanced search results.

Google Earth/Maps

In the emergency context, Google Earth, Google Maps, and Google MapMaker help organizations visualize assets geographically and make it easier for the affected population to find nearby emergency resources. Updated satellite imagery allows for quick damage assessments from thousands of miles away and can help relief organizations navigate disaster zones with, for example, crowdsourced information on available roads.

Last year's 7.0 magnitude earthquake in Haiti prompted us to scale existing tools to assist relief organizations. Organizations often use Google Earth and Maps to develop targeted relief plans, so we updated high resolution satellite imagery from our partner GeoEye within 24 hours of the earthquake and were the first to make such imagery available for public use. In addition, we collected 15-cm-resolution aerial imagery—much cleaner than a satellite can capture—of the affected region. This imagery has been used to conduct wide-scale damage assessments, plan response and recovery efforts such as clinic and hospital placements, and raise worldwide awareness of disasters.

A small Google team traveled to Haiti to better understand how our tools can be useful. We embedded with the 82nd Airborne in a refugee camp in what used to be the Petionville Golf Course. Soldiers from the 82nd used Google Maps to plan the routes they would take while patrolling the area. One of the officers explained to our team that they used Google Maps because "they use tools they're used to."

We found the same to be true after the terrible recent flooding in Pakistan. In the US, we tend to take complete maps for granted. Long before the flooding, two Pakistani web developers decided that available maps of their country were inadequate. So they decided to fix that situation with Google MapMaker, and along the way became some of the top volunteer mappers in the world. All their work played a major role in

helping Pakistanis in the aftermath of the floods last August, when 20 percent of Pakistan was underwater. In response to the emergency, we shared our MapMaker base data with UNOSAT, which is the United Nations' mapping agency. This mapping information was helpful to emergency responders working in that terrible disaster.

These two examples show how Google's flexible, familiar, Internet-based mapping technologies can be quite powerful in a crisis. And more recently, in the wake of the tornadoes in the Southeast US, we requested satellite updates from partners and published a map layer with any useful data we could find about the tornadoes.

Many other organizations have taken advantage of the open Internet and the ability to crowdsource information in order to do incredible mapping work. Open Street Map, for example, has been credited with making the most complete map of Haiti's roads ever by getting the Haitian Diaspora to volunteer their knowledge. Ushahidi, another technology nonprofit, also allows for the creation of maps illustrating, for example, political violence in Kenya that people report through Twitter, email, or SMS.

Person Finder

Now I'll turn to Person Finder. Person Finder is an open-source web-based application that allows individuals to check and post on the status of relatives or friends affected by a disaster. Before Person Finder was developed, those seeking missing loved ones had to sift through multiple websites, posting the same inquiries over and over, hoping that the person they were seeking happened to register with one of these websites. In Haiti, for example, we noticed that there were 14 different missing persons databases. They were not integrated, all were running on different infrastructure, and all had a different amount of data that together represented all missing persons records.

To make this process more effective and efficient, while continuing to leverage the power of crowdsourced information, our team built Google Person Finder to act as a central database, pushing and pulling the feeds from all 14 databases, and allowing users to search across the information in all of the databases. Google Person Finder accepts information in a common machine-readable format called PFIF (People Finder Interchange Format), which was created by Hurricane Katrina volunteers in 2005. Our team worked around the clock to build and launch Person Finder in less than 72 hours during the early days of the crisis in Haiti. We have now made this resource available in more than 42 languages.

While we've used Person Finder for several disasters over the past year, the 9.0 magnitude earthquake and tsunami that struck the Tohoku region of Japan on March 11 led to its biggest use. People around the world struggled to connect with their loved ones as telecommunications services flickered. With phone and SMS networks overburdened by traffic, it was difficult to find out if loved ones were alive and well. But the Internet generally continued to function well, and Person Finder became a critical tool.

The product is purposefully simple, fast, and easy to use. More importantly, it is backed by an open programmatic interface, or API. This means that different sites can update missing persons lists automatically using the common format. Because of this, The New York Times, CNN, NPR, and a number of other websites quickly integrated Person Finder, increasing the reach and resulting in a more complete list of missing persons.

Today, Person Finder is a completely open source tool with a healthy discussion group and numerous external contributors. Person Finder helped manage more than 55,000 records of missing persons in Haiti, 75,000 records in Chile, and more than 600,000 records after the earthquake in Japan. We saw over 36 million pageviews in the first 48 hours after that earthquake. That number is likely overwhelming to most organizations and even government agencies, but we have the infrastructure to handle that volume.

Our own Senior Product Manager Kei Kawai lives in California and was trying to get in touch with his family back in Japan after the earthquake. He confirmed each person's safety, but could not make contact with his wife's grandfather, who lives in a town called Soma City that largely got washed out by the tsunami. After posting to Google Person Finder, Kei was relieved when news arrived through a post on Person Finder the next day that his wife's grandfather was safe.

Centralized Information Points

The third Google project I'd like to discuss relates to getting affected populations up-to-the-minute information as a crisis unfolds. As I mentioned earlier, we know from past experience that people turn to the Web for information during crises. Within a few hours of the Japan earthquake, we placed an alert on the Google homepage for Tsunami alerts in the Pacific and ran similar promotions across News, Maps, and other services. As a Tsunami warning was also issued for Hawaii, we saw a massive spike in search queries originating from Hawaii related to "tsunami."

With so many people searching online for critical information, we added an enhanced search result so that people could connect with emergency information as easily as possible. For example, someone in Japan who did a Google search for their town name plus the word "blackout" would have seen the scheduled blackout information above the typical search results. This information was not easily available before our work and we had to scrape numerous government websites and convert the data into machine readable formats. In the case of the recent tornadoes in the US, we enabled enhanced search results for Alabama and surrounding states with a link to the maps. The enhanced results appear when local users search for "tornado" or "twister."

Access to and use of Google search is generally widespread and many people turn to us in emergencies. As a result, we often create central crisis response sites where information such as emergency numbers, access to temporary shelters, news updates, maps, videos, user generated content, and donation opportunities are aggregated. Millions of people visit these landing pages which are created in a matter of hours and sometimes linked to on the country specific Google homepage. Those seeking information on an emergency generally fall into three categories. First, people directly affected who are looking for information such as power outages, temporary shelter, and how to respond. Second, people indirectly affected looking for family in the area or looking to share useful information. And third, aid organizations looking for imagery, to coordinate their response, and for logistical assistance. Our landing pages seek to assist each group. Furthermore, these pages allow people around the world to learn more and make donations. Our past landing pages have driven many millions of dollars of donations to relief organizations.

How Governments Can Support Technology Efforts in Crisis Response

Now that I've discussed how Google is approaching the use of technology in emergencies, I'd like to discuss one big way that governments and other organizations can support these and future efforts—by maintaining and even enhancing the openness and interoperability of the information available on the Internet.

An open and interoperable Internet allowed users to track the recent Australian floods on an interactive map because the map used the Keyhole Markup Language (KML), a machine readable and crawlable format used to describe geographic information. An open standard, namely the People Finder Interchange Format, or PFIF, also allows Person Finder to access and coordinate more than a dozen different databases, which gave those seeking family and friends in Japan access to more than 600,000 records.

But openness and interoperability do not characterize all parts of the Internet. The ability of the Internet to capitalize on its potential of assisting in crises depends on both companies and governments improving how they share information. Using divergent standards slows collaboration and response time. But speedy and open access, powering the ability of users to share and communicate information, accelerates relief efforts.

To pursue some of the projects I've described, Google had to gather emergency information from government websites in arcane formats and then translate them into open standards. Sometimes the information was spread across numerous websites. Other times, the licensing status of the data was not readily apparent. And even today, some important data is not even online at all, but is in someone's spreadsheet on their personal computer.

On the other hand, for example, the open KML standard, allows people to quickly create maps about shelter locations, escape routes, and emergency plans—and it is so easy to use that you don't have to be an expert developer to build a map. Governments and NGOs such as the Red Cross that maintain such lists could use KML, and if they inform us when they surface this information in advance of a disaster, we could feature it on our pages. It helps if this collaboration occurs in advance of a disaster, not in the middle of an emergency.

Similarly the PFIF allows organizations and users to easily upload information with a common format and to speak a simple common language so we can identify individuals in a consistent manner, making it simple for computers to automate the process of syncing multiple databases. Without this open platform and common standard, efforts to find missing persons become less coordinated and far more taxing on all parties. We ask organizations with missing persons databases to adopt the PFIF standard and encourage local governments and police to use PFIF as well. The troubling truth is that many organizations gathering missing persons information—as well as other critical data such as public health information—continue to do so on paper. The result is that we find boxes of unprocessed forms sitting in offices long after we have lost the chance to use them to help people. Wide adoption of PFIF can help.

And lastly, we recommend adoption of better alerting systems that leverage the Common Alerting Protocol (CAP) standard to quickly inform users of impending crises such as tsunamis and everyday alerts including transit delays. The Integrated Public Alert and Warning System operated by the Department of Homeland Security is a great first step. Agencies such as NOAA, for weather alerting, and USGS, for earthquake notifications, have done a great job being early adopters of CAP, but they require resources to improve the initial work they've done and allow for a truly robust Internet based warning system.

With better alerting systems, if they are implemented in an open and interoperable fashion, private actors such as Google could interact with government systems to display alerts tailored to geography, vulnerability, and situation. And we could do so in an open manner so any other Internet company or emergency organization could use or build on it.

Conclusion

I would like to conclude by thanking Chairman Pryor, Ranking Member Brown, the members of the Senate Committee on Homeland Security and other Members of Congress who have taken an interest in technology and crisis response. We will continue to work to help users instantly find the information they need when crises hit. We recommend the adoption of simple, open, and standard ways of publishing and disseminating information. And we look forward to working with you, government agencies, and emergency relief organizations. We play a modest role in comparison to the actors who work on emergency relief as their core mission, but we will continue to try and improve the use of Internet-based technologies for preparedness, response, and recovery, whether the emergency is a Pacific tsunami or tornadoes in the South.