SWCP Portal
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When keeping connected is literally life and death

Disasters and the Internet

The fall of the twin towers on that clear morn sixteen years ago changed everything. The attack itself was met with established tools of disaster management. Hastily-manned command centers gathered information from the streets to mobilize resources and police while air traffic controllers struggled to make sense of what was happening above. Confusion and panic were fueled by **communications breakdowns**.

Chaos lingered a long time afterwards. Makeshift bulletin boards to seek the missing and memorialize the dead sprang up on the streets of New York. It took months before the fates of some of the victims were determined. Many who desperately wanted to help were stymied by a **lack of coordination**.

9/11, the first great calamity of the twenty-first century, has been followed by a mounting chorus of catastrophes. Hurricane Katrina and the Indonesian tsunami were succeeded by more great storms and earthquakes, civil wars and terrorism, and just within the last few weeks, the devastation of south Texas, Puerto Rico, and Mexico City. The **best news** coming from this drumbeat of destruction might be that each time, the net helped to limit the damage more.

Prediction and live tracking

Many different technologies contribute to the effort, including remote sensing. New **weather satellites** with enhanced sensing constantly can spot floods across the planet as they happen, but they can still only observe from high above. A **global seismograph network** and **ocean buoys** now deliver information from the planet's surface and below, which beam it to ground stations and out onto the net.

Due to a lack of sensor buoys **in the region**, the tsunami produced by the great Indian Ocean earthquake in 2004 could only be tracked from space. Many coastlines had little or no warning. Since then, **wave sensors** have been deployed across the oceans, with sensitive instruments to detect **ground deformation** placed in various crucial locales.

All these devices are connected together wirelessly over the internet with command centers. Available sensor data can be correlated with first responder reports to provide authorities with a better picture of actual conditions than ever before. By the time **Harvey** hit Texas, data from solar-powered flood gauge sensors and drivers using the **Waze app** to report road conditions was combined with satellite views to generate a real-time map-based interface for first responders called the **Disaster Response Program**.

An **automatic quake warning system** substantially reduced damage in Mexico recently. Alarms sound when the first shock is sensed, but that few seconds were enough to shut down critical infrastructure such as reactors and high-speed trains. However, the likelihood of massive quakes, volcanic eruptions, and meteor strikes can only be gauged as probabilities.

The moment a crisis begins, the internet comes into its own. Its value was **proven** in the 9.0 earthquake that struck Japan in 2011. The Japanese instantly turned to cellphones and social media. During the 20 minutes between the quake and the tsunami striking, online warnings flashed to coastal dwellers to escape to higher ground in seconds, faster even than TV and radio broadcasts mangaged. **After the flood**, while Facebook's person finder was invaluable for locating missing family members, Twitter gave trapped people vital news of road closures and working routes to safety.

In fact, Twitter, Facebook, and Instagram became the only **sources** where up-to-the-minute news was constantly available. Celebrities lent their own accounts to spread life-saving info to followers. Within days, Google, Yahoo, and Japan's own Mixi became online havens to seek lost relatives, find ways out of their stricken areas, and report needs to authorities. Later, the web served to generate and collect aid donations and marshal help from the international community.

Analysis showed that the internet's infrastructure was indeed more robust than other forms of telecommunications. Email proved vital for maintaining government communication and coordination, providing the single remaining reliable channel to prevent emergency responses from being bogged down when all other means failed or clogged up.

But the effort required more than random tweeting by officials. Accurate reporting all across social media was vital to keep information steadily flowing about rescue operations, shelter locations and relief stations, and to inform the world outside what was happening. In the absence of official statements, sheer numbers of people posting live from the scene kept misinformation and wild rumors to a minimum. In

the end, Japan was so impressed by Twitter's role, it is **considering** making the platform its standardized means of communication during disasters. Facebook has added **Community Help** to its **Safety Check** feature, so that users can find resources as well as family.

In this country, the Air Force just turned over an **old satellite** to HAM radio operators who often provide emergency connections, while FEMA is launching a **new satellite** to help. They are also offering a mobile **emergency alert app** to provide weather alerts, shelter locations, and survival checklists.

One app that has proven handy is **Zello**, a free push-to-talk communication system that can turn phones or tablets into a two-way radio. Essentially, they become walkie-talkies, with up to 1000 worldwide channels. To work, however, Zello requires WiFi or at least a 2G data connection.

Another scheme that uses internet connectivity but bypasses the hierarchy of access points and servers is called **mesh networking**. There are a variety of types, including **wireless ad hoc networks**. In this plan, every device becomes a data node which forwards data to other nodes. Connections may be slow but in those situations where there are a lot of internet-connected devices but landlines are down, such methods might someday provide a vital alternative.

Mesh networking can also work with cellphones. A startup called the **Serval Project** is developing an **app** to connect cellphones for voice or data, if there are enough with the app in an area. Luckily, the **Serval app** can be passed on via WiFi or Bluetooth, too. However, such radio connections eat a lot of power.

The cellphone system is more likely to survive calamities than landlines but it has limits. Puerto Rico was down to one barely-working cell tower on the entire island and the electrical grid has been knocked out.

This is the critical weakness: communications consumes electricity. While solar-powered **cellphones** were introduced by Samsung in 2009, and **Amazon** now offers rafts of solar chargers, there are few solar cellphone towers in operation. While India and other countries with little infrastructure have taken to them, here they are **found** almost exclusively serving remote, isolated communities. As with all things solar, **battery life** and expense are still issues.

A new class of tools now being successfully deployed are **drones**, which have the advantage of being expendable. Quadcopter cameras provide live overviews for evaluating the hardest hit locations and structures, road conditions, search and rescue, etc. **NOAA** has been dropping Navy sub-finding drones into recent superstorms as they give better data than old-style radiosondes because they are steerable.

Other robots, however, have not seen much action yet. The meltdown of three nuclear reactors at Fukushima due to the Japanese tsunami highlights the need for rugged, remote-controlled robots able to work in radiation-flooded or other deadly environments. But all the robots sent into the **Fukushima meltdowns** have failed, being fried or even melted.

Seeing the need, DARPA held several **grand robotics challenges**. The humanoid robots tested had a difficult time simply staying upright, much less working in a rubble-filled room, but some progress was made. There are no android firemen on the market yet, but along with flying drones to deliver blood and medical supplies, there are **now** robotic lifeboats, submersibles, rubble-clearing machines, plus technical standards are now being developed for the field.

Someday the **Internet of Things** could be essential, gathering data for forecasts from areas where some power still works. **Smart electrical meters**, with the capability to cut-off service on demand, have been touted as a way to prevent widespread damage to the grid, but they have yet to prove themselves. Beyond obvious applications such as **online stream gauges**, some clever thinking will be needed to find new ways to use connected devices to help.

The internet works so well in disasters because it was designed to **survive** even a nuclear war. These dreadful events have extended its resilience ever further. But we can only hope and pray that the net never faces that ultimate worst-case test.

Girls Developing WordPress Skills

To **encourage girls** to learn coding, a series of workshop sessions will be offered in October, taught by our very own Vice President, Jamii Corley. The **workshop** will use **WordPress**, the most widely-used content management system on the web. By the end of the four two-hour sessions, participants will know how to set-up, build, and successfully manage a WordPress site. They'll be able to start their own exciting blog or photo sharing site.

It costs $100, but refunds and scholarships are available. Go to **Girl Develop It Albuquerque** (**https://www.meetup.com/Girl-Develop-It-Albuquerque/**) for more information on this and all the other coding classes offered for women of all ages.