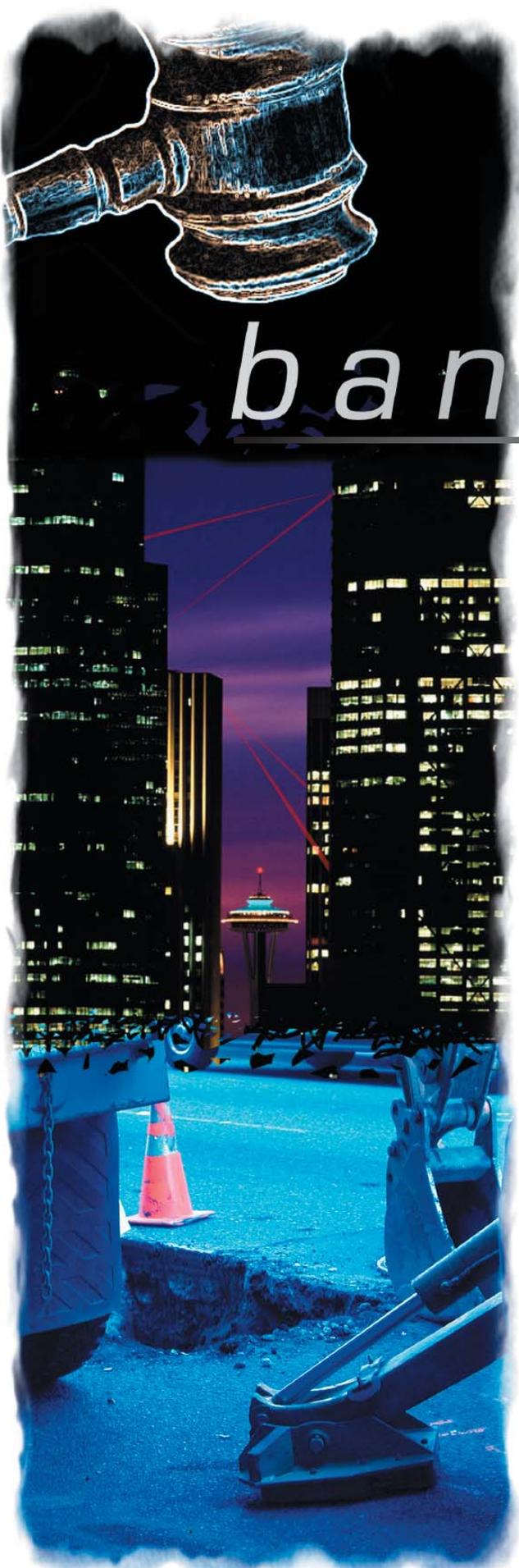


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# bandwidth

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## **KATRINA:** The Sounds of Communications Silence

*Hello darkness, my old friend,  
I've come to talk with you again,  
Because a vision softly creeping,  
Left its seeds while I was sleeping,  
And the vision that was planted in my brain,  
Still remains,  
Within the sound of silence*

**—The Sounds of Silence**  
*(words & music by Paul Simon, 1967)*

By: Senior Fellow John Wohlstetter

**T**he shriek of Katrina's 140 mph winds and rat-a-tat-tat of its driving, torrential rain left in its tumultuous wake a coast silenced by vast devastation. Darkness ruled not just night but day, as the electric grid crash darkened shelters and the lights of fiber-optic cable went off in an instant. Cell towers fell, broadcast stations were yanked off the air, and the voices of a great city fell silent. The city, and parts of the Gulf Coast as well, simply dropped off the globally networked web of voice, data and video communications that define societal participation in the Information Age. The sounds that most often reached one's ears, besides the voices of reporters talking into portable microphones, were those of whirring helicopter blades and episodic cracks of gunfire.

The near total communications shutdown caused by Hurricane Katrina in New Orleans reveals that in the four years since the September 11, 2001 terror attacks, federal, state and local governments seemed to have learned nothing from 9/11. Given that no one doubts the supreme importance of emergency communications capability in enabling rapid response this is a sobering realization. True, given a flood of unprecedented scale massive outages are inevitable. But emergency communications are supposed to be primed to enable rapid recovery despite disruption. Perhaps even more depressing is that bureaucratic negative economies of scale and scope may more than offset positive economies that modern communications can offer. Thus Louisiana Congressman Bobby Jindal reported that one mayor in his district seeking supplies telephoned a federal official, only to find himself put on hold for 45 minutes, after which the official said he would write a memo re the supplies.<sup>1</sup>

### **Katrina's Communications Crash: The FCC's Tally and Response**

The Federal Communications Commission (FCC) tallied three million customer lines, more than one thousand cell sites and 37 of 41 radio stations (two AM & two FM survived) lost in Louisiana, Mississippi and Alabama due to Katrina's fury. More than thirty percent of cell sites were disabled. Satellite carriers did offer phone and video links to first responders and news companies. On August 30 FCC Chairman Kevin Martin established an inter-

nal task force to consider regulatory relief, industry outreach and coordination with other federal agencies. The agency has provided numerous requests for special temporary authority (STA) to speed up operations restoration, plus temporary frequency assignments. To its credit the agency processed requests within four hours of receiving completed forms, and within 24 hours for requests involving coordination with federal agencies. The FCC also maintained continual contact with special federal agencies: Federal Emergency Management Agency (FEMA); the National Communications System (NCS, part of the Defense Department, established by JFK after the 1962 Cuban Missile Crisis); and the National Coordinating Center (NCC, part of NCS, established to liaise between government and industry, including a special White House group called the National Security Telecommunications Advisory Committee—NTSAC).<sup>2</sup>

On September 15 the Commission held an open meeting to discuss the aftermath of Katrina. As of September 14 there were still 350,000 customers without phone service in the Gulf Coast, with 318,000 in Louisiana and the remainder in Mississippi; in addition three 911 call centers remain out of service in Louisiana, along with 650 of the 800 high-capacity long distance lines still out of service on the Gulf Coast. For wireless, 24 switching centers and 3,000 cell sites are operational, with wireless carriers reporting they were up to at least 75 percent operating capacity. Cable service had been restored for 520,000 of 950,000 customers (55

percent), but 39 of 41 broadcast stations were still silent. The Commission granted special regulatory waivers to allow WISPs (Wireless Internet Service providers) to set up Wi-Fi and Wi-Max systems in New Orleans.<sup>3</sup> Wireless carriers began to restore service with two days, compared to five days for wireline.<sup>4</sup>

FCC Chairman Martin announced three ameliorative measures: (1) \$211 million added to the Universal Service Fund, which will enable providing evacuees with handsets and 300 free calling minutes, plus support for communications needs of rural healthcare providers, for enabling priority rebuilds of facilities by providers and reconnecting schools and libraries; (2) a new independent panel to review Katrina's impact on area networks, and recommends ways to improve preparedness, reliability and communications among first responders; (3) create a new Public Safety/Homeland Security Bureau to address public safety, national security and disaster management issues.<sup>5</sup>

Commissioner Abernathy praised telecom firms who provided aid, including much not telecommunications in nature: food and shelter for first responders, fuel for police cars, emergency generators for hospitals. Telecom services included free handsets, calling cards phone trailers, call centers at emergency shelters, unlicensed wireless.<sup>6</sup> Commissioner Copps recounted a harrowing communications tale: His nephew, a doctor at a city hospital lacking food, water and power, went by boat to find a place from which communicate with the outside world. Said Copps: "That worked, as long as the snipers were taking a break."<sup>7</sup>

*What makes post-Katrina communications failure so depressing is that it demonstrates that nothing of consequence has changed since September 11, 2001. Primarily this is a shortfall at the local level. Why did not every state stock \$1,000 satellite phones? Other types of portable equipment? A few thousand is well within the financial means of any state. It is instructive to revisit what the 9/11 Commission found as to communications snafus then.*

## Communications Findings: The 9/11 Report

The 9-11 Commission report<sup>8</sup> addressed communications shortfalls encountered during emergency response. Symptomatic of key infrastructure shortfalls on 9/11 was that Vice-President Cheney's wireless connection that morning to the President on Air Force One repeatedly crashed; the President also could not reach Defense Secretary Rumsfeld, and later expressed "frustration" with communication snafus.<sup>9</sup> The panel report adds new data to that amassed in reports prepared for Big Apple Mayor Michael Bloomberg.<sup>10</sup> Poor radio communications—clogged channels, lack of inter-department compatibility, building links damaged by a huge fireball of jet fuel and ensuing fires—plagued rescue efforts.<sup>11</sup> The City's Office of Emergency Management and Emergency Preparedness, established by then-Mayor Rudy Giuliani and intended to monitor emergency communications during a crisis as part of managing the city's overall response, proved unable to coordinate multiple responders; the New York Fire and Police Departments viewed themselves as essentially autonomous in their operations.<sup>12</sup> The panel praised the Fire Department for upgrading communications since 9/11.<sup>13</sup>

The emergency response at the Pentagon was generally more effective, partly due to the smaller scale of the attack and concomitant destruction; but communications were frequently "problematic," with radios "oversaturated" [sic] and cellphones "of little value." Pagers worked best.<sup>14</sup> The panel recommended allocating more spectrum for public safety purposes, plus establishing signal corps units for "high-risk urban areas" like New York and Washington; these corps would allow civilian and government first responders to coordinate emergency response.<sup>15</sup>

Inability to communicate clearly cost lives on 9/11 at the Twin Towers. In a new reportorial book detailing events from the impact of the first plane to the collapse of the second tower, the authors state:

On the 19th floor of the north tower, scores of doomed firefighters were seen...taking a rest break in the final minutes, coats off, axes against the wall, soaked in sweat. As an explanation for why [they] did not escape, a lack of awareness seems far more likely than the mayor's position that firefighters were tied up helping civilians. The lack of a 'situational awareness,' to use the military term, was not simply a consequence of being overwhelmed by the new epoch in terror that had arrived."<sup>16</sup>

The "situational awareness" the firefighters lacked was two-fold. First, most of the north tower's 6,000 people had successfully evacuated. Second, police riding in helicopters circling the towers predicted that the north tower would soon collapse, an assessment not communicable to the firefighters. The authors estimate that as many as 200 firefighters lost their lives, with many close to freedom. Inter-agency radios were sitting on the shelf, but with raging fires even with them it would have been hard to get a message through. With 29 minutes between collapse of the south and north towers, firefighters within 30 or 40 floors of safety could have evacuated. Most of the people trapped in the north tower were above the 91st floor; firefighters 50 or 60 floors below would have realized that they could not possibly rescue them given imminent collapse, and thus could have retreated to safety. (Mayor Giuliani had said that firefighters trapped were taking civilians out, but the narrative by the authors indicates most had left and most who remained were out of reach of rescue.)<sup>17</sup> Heroes were lost to silence.

Two recommendations of the 9/11 Commission focused on communications:

**Recommendation:** *Emergency response agencies nationwide should adopt the Incident Command System (ICS)<sup>18</sup>. When multiple agencies or multiple jurisdictions are involved, they should adopt a unified command. Both are proven frameworks for emergency response. We strongly support the decision that federal homeland security funding will be contingent, as of October 1, 2004, upon the adoption and regular use of ICS and unified command procedures. In the future, the Department of Home-*

*land Security should consider making funding contingent on aggressive and realistic training in accordance with ICS and unified command procedures.<sup>19</sup>*

**Recommendation:** *Congress should support pending legislation which provides for the expedited and increased assignment of radio spectrum for public safety purposes. Furthermore, high risk urban areas such as New York City and Washington, D.C., should establish signal corps units to ensure communications connectivity between and among civilian authorities, local first responders, and the National Guard. Federal funding of such units should be given high priority by Congress.<sup>20</sup>*

9/11 panel co-chairs Thomas Kean and Lee Hamilton wrote an op-ed slamming the failure of emergency communications after Katrina. Calling for return of the extra video channels broadcasters got in 1996, they wrote:

*Last year, the 9/11 commission issued recommendations to rectify these two failures: Congress should reallocate high-quality broadcast spectrum for public safety radio use, and states and localities should establish - and practice - unified command procedures for responses to major disasters. Each of these common-sense recommendations would have saved lives on 9/11 and in Katrina.*

*As we noted in a report issued last week, there has been minimal progress on these two recommendations. For the past four years, other priorities have been judged more important than giving police and firefighters the radio frequencies they need to communicate during a terrorist attack, or planning ahead so that rescue efforts during major disasters are coordinated and efficient. This is scandalous. What priority of the government could be more important than the safety of our first responders and those they protect - the American people?*

*In Katrina, public safety communications failed again. New Orleans and three neighboring parishes were using different equipment and different frequencies - they couldn't talk to one another. Helicopter crews couldn't talk to rescuers in boats. National Guard commanders in Mississippi had to use human couriers to carry messages.*

*Command and control were just as dismal. Early search-and-rescue operations were improvised by field commanders, so different agencies often covered the same ground.*

*There was a vacuum of centralized authority, and little coordination. Put simply, no one knew who was in charge.*

*After 9/11 and Katrina, it is high time to implement the reforms recommended over a year ago by the 9/11 commission to solve these very problems.<sup>21</sup>*

In the same vein was an op-ed by four Members of Congress (Senators John McCain [R-AZ] & Joseph Lieberman [D-CT], Representatives Jane Harman [D-CA] & Curt Weldon [R-PA]):

*The federal government has sat by and allowed this problem to remain unresolved for four years following the devastation of September 11, 2001, even as many predicted another disaster. After watching the horrific communications breakdown that occurred during Katrina, will we wait another four years before acting? How many more lives will be lost? What kind of catastrophic disaster is necessary for Congress to give these heroes the tools they need to save lives?<sup>22</sup>*

## Saving Spectrum for Safety

There are, according to a 2003 study by the RAND corporation, 3.2 million emergency responders in the U.S.: 1.1 million firefighters (75 percent are volunteers), 800,000 law enforcement officers, 500,000 emergency medical responders, 500,000 in the National Guard and 300,000 “other essential workers.”<sup>23</sup> One expert tallies over 50,000 independent public safety agencies nationwide.<sup>24</sup> In 1999 the federal government did a study estimating that it would cost \$18 billion to equip every first-responder with a compatible radio device.<sup>25</sup> It is, however, far from clear that a single device would meet the diverse needs of various distinct skill sets; device uniformity is less important than a subset of common communications capabilities. Such would increase cost but is a price surely worth paying.

A June 2004 report by the U.S. Conference of Mayors found that 80 percent of America’s cities do not have emergency communications that are inter-operable with each other, or with state and federal agencies; 97 percent of cities cannot communicate for chemical plant disasters, 94 percent

cannot for rail disasters and 92 percent cannot for seaport disasters.<sup>26</sup> The value of embedded public safety communications base is an estimated \$60 to \$70 billion, 99 percent paid by the states and localities.<sup>27</sup> Terrorists will not target randomly, like Katrina.

Begin with the 9/11 panel’s spectrum option, then go to Stage II: Re-allocate the rest of the 402 megahertz of conventional television broadcast spectrum, yielding not only the spectrum for common nationwide emergency frequencies, but also freeing the rest for commercial use. (The latter would increase network capacity for use by the general public during disasters—essentially, “Hi, Mom!” calls.) Currently, public safety mobile communications has a total of 23.2 MHz of exclusive spectrum and 24 MHz of spectrum shared with broadcast television, in radio frequencies below 900 MHz (ideal for emergency use).<sup>28</sup>

The TV channels are located in frequency bands (VHF and UHF<sup>29</sup>) ideal for transmitting into and out of buildings: the longer the radio wavelength the better it penetrates barriers. This is why your TV set works in your basement, while your PCS phone does not. This spectrum should be reclaimed by the federal government and re-auctioned. Private-sector first responders must be included, as 85 percent of the nation’s critical infrastructure is privately owned.<sup>30</sup> Proceeds from the spectrum auction could fund re-locating TV users, plus construction of new network equipment needed to complete the conversion.

With 100.8 million of 110.2 American households now receiving broadcast channels via either cable (73.2 million<sup>31</sup>) or non-cable—mostly satellite (27.6 million<sup>32</sup>), only about 10 million homes among broadcast television viewers lack alternative video access (98 percent of American homes have at least one TV). Users not currently receiving cable or satellite can be reached by one or the other. The government should thus take three specific steps:

- *Re-claim the broadcast spectrum from broadcasters, first taking back the extra channels*

*given them in 1996, then the remainder at fair market value;*

- *Mandate a “broadcast channels only” package for cable and satellite providers to offer to broadcast channels-only customers; and*
- *Offer to pay a year or more of the service, to induce customers to switch.*

The FCC has set a December 31, 2006 deadline for return of the second channel given broadcasters, provided that digital set penetration has reached 85 percent.<sup>33</sup> This is very probably by several years optimistic. Thus, spectrum currently grossly redundant for entertainment television holds hostage a vast improvement in public safety. There should be designated common nationwide spectrum frequencies dedicated to emergency use. Within each state there should be more frequencies set aside for intra-state use. Major cities might need dedicated channels as well. Alternatively, if reclaimed spectrum is used commercially a priority override can be given first responders in time of emergency. This entails programming network switches to recognize priority traffic.

The four Members of Congress quoted earlier are co-sponsors of the Save Lives Act of 2005, introduced this past June.<sup>34</sup> The bill would: (1) require broadcasters to surrender their second channels by January 1, 2009—specifically, the 24 MHz of UHF spectrum now shared with TV in the “700 Band”; (2) provide funding for emergency agencies to buy emergency-related communications equipment; (3) provide financial assistance for viewers with incomes below 200 percent of the poverty line to buy digital set-top converter boxes; and (4) require cable operators to carry broadcast signals (the so-called “must-carry” rule). (It is not self-evident that 24 MHz will be enough for all desirable emergency use of this spectrum band; should more be needed it should be so allocated as top priority usage for reclaimed spectrum.)

## **Spectrum and Utility: Highest and Best Use**

For Stage II the government should pay FMV for the original licenses because nearly all broadcast television spectrum has changed hands in the marketplace, so that few original grantees of *gratis* spectrum are around—but FMV here is current FMV as broadcast spectrum, not its higher value as CMRS (Cellular Mobile Radio Service) spectrum, which would yield broadcasters a huge windfall. Paying compensation to viewers required to relocate eases the political whiplash. If 10 million users pay \$5 per month for just broadcast channels (a price comparable to some limited satellite packages), one year’s service would cost \$600 million. A graduated transition for current “rabbit ears” viewers can be employed to ease “sticker shock.” A three-year phase-out, reducing coverage by a third each year, would double the program cost, to \$1.2 billion.

Thomas Hazlett, a professor at George Mason University and former FCC economist, addressed the spectrum issue in a piece for the Manhattan Institute while a scholar there. Hazlett would privatize the TV spectrum by auction. He notes that while *67 TV channels are allocated for 210 markets, on average just over seven stations are in use per market.*<sup>35</sup> This is a staggering waste of immensely valuable resources. Hazlett has calculated costs and benefits of migrating analog TV viewers to subscription cable and satellite. Migrating TV users to cable or satellite entails an up-front cost of about \$300 per subscriber per set, covering set-top converter box and installation. Thus, single-set migration would run about \$3 billion (total set migration would cost \$7.3 billion at 2.43 sets per home, but TV-only subscribers probably have fewer sets.)

Recent transactions for PCS licenses suggest a valuation of \$29 billion for 30 MHz of nationwide spectrum; this suggests that the market value of spectrum wastefully tied up for duplicative television transmission is \$388.6 billion. Further there is the “social value” of migration, by increasing con-

sumer surplus by much more than the decrease in producer surplus.<sup>36</sup> Auctioning off TV spectrum would make private buyers carry the cost of buying out the broadcast spectrum. With a large sale it should go for much less than \$389 billion. Hazlett cites an FCC calculation done when then-Missouri Senator John Ashcroft proposed migrating the broadcasters; the FCC put a range of \$20 - \$132 billion on the spectrum.<sup>37</sup>

In a more recent (2004) estimate, Hazlett and economist Roberto Muñoz estimated (round figures) \$32 billion for 80 MHz reallocated to CMRS, \$55 billion for 140 MHz and \$77 billion for 200 MHz.<sup>38</sup> This range is far less than the likely bill for Hurricane Katrina, even if one ignores offsetting economic benefits. Leading European countries have allocated nearly twice as much spectrum for commercial use than has the U.S. *More than any other government policy decision, freeing up grossly underutilized broadcast spectrum would improve emergency response and unlock vast increased consumer value through higher value spectrum usage.*

But Kenneth G. Robinson, a former adviser to FCC chairman Al Sikes, suggests that new purchasers of spectrum pay a premium above broadcast value—in effect, share the “delta” (the increased value derived from higher use) with the government in the form of public interest benefits. He draws an analogy to land re-zoning, which developers frequently offer benefits to the public as part of a deal. Following such a prescription could yield substantial revenue to the government which could be dedicated to improving emergency connectivity.<sup>39</sup>

### Accelerating Spectrum Transfer: Dump Digital Broadcast Television

Senator McCain and his colleagues are willing to wait until 2009 for 24 MHz of exclusive-use public safety spectrum. Will 85 percent of U.S. households have digital sets by then? While we wait, hurricanes and terrorists will not sit idle. Let satellite and cable deliver digital signals. *Cancel the digital*

*broadcast mandates.* A buyout for broadcaster investments made in reliance on the old policy is reasonable; it will cost a lot less than Katrina. Start an accelerated emergency communications program now.

### Wireless: Four Emergency Metrics

As emergency connectivity must of necessity be mostly wireless, criteria for selection are critical. Four properties are needed to maximize the utility of wireless networks: (1) **portability**—the property of *location* independence, *i.e.*, ability to access the network any any given geographic location; (2) **mobility**—the property of *motion* independence, *i.e.*, ability to communicate while traveling between points; (3) **separability**—the property of *device* independence, *i.e.*, ability to use a device without being tethered to it, such as hands-free use; and (4) **ubiquity**—the property of *pervasive* access points, *i.e.*, wherever one is, there are usable network entry points.

Lightweight, self-powered wireless systems best fit the bill. A former FCC chairman, Reed Hundt, has proposed equipping every first-responder with Wi-Fi-compatible handsets, to be called an Emergency Transponder, costing an estimated \$150 per set; the device would have voice, text and paging functions.<sup>40</sup> This is a plausible proposal, but as noted earlier a single device may not fully meet the varied needs of different teams. Further, there is a political problem: Turf wars between the various emergency responders are famously ferocious, and could block pooling of capabilities.<sup>41</sup>

### Network Vulnerability: Worse Weather Ahead?

Katrina was random in its destructiveness. Terrorists might choose targets with greater care. Networks have four fundamental sources of vulnerability. They are: (1) global; (2) accessible; (3) programmable; and (4) fragile. The global digital network has “cascade” vulnerability, because the

widely dispersed geographic physical infrastructure is managed by network software that creates a unitary logic superstructure that controls the physical assets. Faulty logic can crash the entire network. That software is programmable: If a hostile user can gain “administrative privilege” he becomes a *de facto* network administrator with power to maliciously alter the way the network runs. And networks are fragile, in that rebuilding them can be a complex, time-consuming task.

Thus, a software glitch that propagated through 114 switch modules in AT&T’s 1990 long distance network on Martin Luther King Day in 1990 crashed AT&T’s entire SS6 network (a specialized inter-office signaling network that carried 58 percent of AT&T’s network traffic). Physical network diversity can be less than meets the eye—a 1988 central office fire in Hinsdale, Illinois caused telephone company equipment to burn up, and also fried co-located equipment attached by competitors to the network inside the same building. Global vulnerability can be mediated by gateways that confine failures to one carrier’s network, but failures can still cause large networks to crash. Viruses sent over the Internet can bypass gateways and thus cause networks to crash worldwide. *Repair can be devilish: It took two weeks to fully repair AT&T’s network after the 1990 crash, because the culprit was a single punctuation error in a single line of software code, which illustrates how fragile modern digital networks can in fact be.*<sup>42</sup>

There are, as well, more pedestrian sources of local vulnerability. Telephone switching centers typically have an eight-hour backup electric power capability; BellSouth flew in 1,200 generators as part of its New Orleans recovery effort.<sup>43</sup> Incompatible radio systems plagued New Orleans just as they did New York; federal, state and local systems rarely work together smoothly. Common spectrum for emergency communications, derived from re-allocating underused broadcast spectrum, is thus an urgent national priority.<sup>44</sup>

## Rebuilding New Orleans: A Model Network?

There have been calls from some quarters that the destruction of most of the city’s telecom infrastructure offers an opportunity to leapfrog technology and build a model network.<sup>45</sup> For several reasons this seems a better idea than it actually is likely to prove in real life. First, the city’s ossified economy is minimally diversified, its revenue derived mostly from tourism; a city with a fully diversified economy is a better candidate for a modern network. Second, the city sits on water, so laying deep cables is more expensive than in other urban environments. Third, the city is neither known for managerial competence nor rectitude; state homeland security officials were indicted pre-Katrina for misusing disaster funds.<sup>46</sup> (Ex-Louisiana Congressman W. T. [Billy] Tauzin once quipped: “One half of Louisiana is under water and the other half is under indictment.”<sup>47</sup>)

Already, the widely-publicized Philadelphia program to deploy Wi-Fi to everyone as a city-wide municipal network is in trouble. One year after “Wireless Philadelphia” was announced to great fanfare, the program is behind schedule and over budget. Originally projected to be completed in one year for \$10 million, now projections say two years and \$15 to \$18 million. Worse, the network aimed to offer service at \$15 to \$18 per month, and Verizon already offers monthly service for \$14.95.<sup>48</sup> Philadelphia may not be a model community for competence and rectitude, but it seems unlikely that it is more deficient in those respects than is New Orleans. Moreover, the City of Brotherly Love does not float on water below sea level, and its local economy is far more diversified and vibrant.

## An Emergency Platinum Standard: The 1906 San Francisco Quake

At 5:12 AM on April 18, 1906 a massive earthquake (8.3 Richter scale) inflicted vast damage on San Francisco. Author Simon Winchester reports in his upcoming book on the quake that within twenty

minutes soldiers were on the street, by 11 PM that night the first relief train arrived (from Los Angeles) and by 4 AM on April 19 president Theodore Roosevelt's Secretary of War, William Howard Taft, had ordered supply trains from all over the country to head for the city, including the longest hospital relief train ever assembled.<sup>49</sup> Compare that with what press reports told us in 2005: (1) It took Louisiana's Governor more than 24 hours to call up the Louisiana National Guard after the levees broke. (2) New Orleans' Mayor had, it turns out, a phantom evacuation plan. (3) The President's advisers

negotiated for days with the Governor, seeking approval to federalize the disaster response. (4) The Superdome and Convention Center were anarchic urban indoor hells for nearly one week.

*A worthy goal for future disaster recovery is to catch up by 2006 to what was done in 1906. Darkness was Paul Simon's "old friend," in which he saw a vision within the sounds of silence. Katrina's sounds of communications silence are an old nemesis of disaster recovery—a silence that befriended only the predators.*

During his years in the telecommunications industry John C. Wohlstetter served (1986-1989) as Senior Adviser to the Committee on Review of Switching, Synchronization and Network Control in National Security Telecommunications. The Committee was established by the Board on Telecommunications and Computer Applications; the Board is part of the National Research Council, the operating arm of the National Academy of Sciences. The Committee produced a report warning that modern networks were becoming increasingly vulnerable to massive disruption due to trends in technology, regulation and markets, entitled *Growing Vulnerability of the Public Switched Networks: Implications for National Security Emergency Preparedness* (National Academy Press 1989).

## ENDNOTES

<sup>1</sup> [Deadly Bureaucracy](#), Wall Street Journal, Sept. 8, 2005.

<sup>2</sup> [Written Statement on Hurricane Katrina](#) of Kenneth P. Moran, Director, Office of Homeland Security, Enforcement Bureau, Federal Communications Commission (House Committee on Energy & Commerce, 9/7/05).

<sup>3</sup> Presentation of Kenneth Moran, Agenda Meeting of the Federal Communications Commission, Atlanta, Georgia (Sept. 15, 2005).

<sup>4</sup> Statement of Chairman Kevin J. Martin, Sept. 15, 2005 Open Meeting, *Effects of Hurricane Katrina*, p. 1.

<sup>5</sup> *Id.*, pp. 2-3. Nine policy areas will be covered by the new Bureau: public safety communications; priority emergency communications; alert & warning of U.S. Citizens; continuity of government operations; disaster management coordination (*i.e.*, infrastructure reporting & analysis in times of disaster); disaster management outreach; communications infrastructure protection; network reliability and interoperability; network security. *FCC takes Steps to Assist in Hurricane Disaster Relief*, FCC News, Sept. 15, 2005.

<sup>6</sup> Statement of Commissioner Kathleen Q. Abernathy, pp. 1-2, Sept. 15, 2005.

<sup>7</sup> Statement of Commissioner Michael J. Copps, p. 3, Sept. 15, 2005.

<sup>8</sup> *The 9/11 Commission Report: Final Report of the National Commission on Terrorist Attacks Upon the United States*, 567 p. (W.W. Norton & Company 2004).

<sup>9</sup> *Id.*, p. 40.

<sup>10</sup> Prepared by McKinsey & Co. to assess performance of the New York Police and Fire Departments, the reports were discussed in the November 13, 2002 issue of *Bandwidth*, [9-11 Plus One: Have Lessons Been Learned?](#).

<sup>11</sup> *9/11 Report*, fn. 8 *supra*, pp. 281-83. Further details are presented in the report, pp. 278-323.

<sup>12</sup> *Id.*, pp. 282-85.

<sup>13</sup> *Id.*, pp. 321-322.

<sup>14</sup> *Id.*, pp. 314-15.

<sup>15</sup> *Id.*, pp. 396-97.

<sup>16</sup> Dwyer, Jim & Flynn, Kevin, *102 Minutes: The Untold Story of the Fight to Survive Inside the Twin Towers*, Page 252 (Times Books 2005).

<sup>17</sup> *Id.*, pp. 60-62, 250-52. The authors state that the inter-agency radios intended to link police and fire commanders went unused due to protocol disputes regarding their use. *Id.*, p. 60.

<sup>18</sup> [ICS](#) is an emergency response command training program housed in FEMA.

<sup>19</sup> *9/11 Report*, fn. 8 *supra*, p. 397.

<sup>20</sup> *Id.*

<sup>21</sup> [Do More Have to Die?](#), NY Daily News, Sept. 18, 2005.

<sup>22</sup> [A Fix for First Responders](#), Washington Post, Sept. 19, 2005.

<sup>23</sup> Hundt, Reed E. & Malamud, Carl, [A Better Communications System for Emergency Workers](#), Center for American Progress, Sept. 9, 2005.

<sup>24</sup> Peha, John M., [Protecting Public Safety With Better Communications Systems](#), IEEE Communications (March 2005).

<sup>25</sup> *Id.* The study was done by the Public Safety Wireless Network, now ensconced in the Department of Homeland Security.

<sup>26</sup> *Making Communities Safer: Immediate and Near-Term Solutions to Resolve Interoperable Communications Problems for First Responders*, p. 36, New Millennium Research Council (Sept. 14, 2004).

<sup>27</sup> *Id.*, p. 35.

<sup>28</sup> Determining how much spectrum is used for public safety is a tricky exercise. A spectrum allocation chart is maintained by the National Telecommunications and Information Administration (NTIA), which is in the Department of Commerce; NTIA [also allocates federal government spectrum](#). Current shared public safety spectrum is 72.47 MHz, at 35-35 MHz, 42.43.69 MHz, 72-73 MHz, 75.4-76 MHz, 150.8-152.855 MHz, 157.45-161.575 MHz, 454-455 MHz, 470-512 MHz & 806-821 MHz; exclusive public safety spectrum is 52 MHz, at 824-849 MHz, 849-851 MHz & 869-894 MHz. Microwave spectrum actually begins at 890 MHz, so there is 4 MHz technically within the microwave band. But the FCC, in a 2001 report, tallied only 47.2 MHz: 6.3 MHz in the 25-50 MHz “VHF Low Band”; 3.6 MHz in the 150-174 MHz “VHF High Band”; 0.1 MHz in the 220-222 MHz “220 Band”; 3.7 MHz in the 450-470 MHz “UHF Band”; 24 MHz in the 764-776 MHz & 794-806 MHz “700 Band”; 3.5 MHz in the 806-821 MHz & 851-866 MHz “800 Bands”; 6 MHz in the 821-824 MHz & 866-869 MHz “NPSPAC Band.” In addition, the FCC tally shows 2 VHF Public Cost channel pairs

in each Inland VHF Public Cost area for interoperability communications. In three urban areas there is spectrum for public safety in the 421-430 MHz band. Eleven urban areas have public safety spectrum in the 470-512 MHz band, shared with TV broadcasting. *Alternative Frequencies for Use by Public Safety Systems: Response to Title XVII, Section 1705 of the National Defense Authorization Act for FY2001*, Attachment A (*Summary of Spectrum currently Used for Public Safety Below 900 MHz*), Federal Communications Commission (2001). The FCC figure appears to be right, as frequencies available for public safety use on the NTIA chart include those where the FCC has declined to issue radio licenses to public safety users. The 24 MHz in the 700 Band is shared with broadcast television and thus the true availability of public safety spectrum under 900 MHz is the 23.2 MHz dedicated to state and local use. The 24 MHz in the 700 Band—764-776 MHz & 794-806 MHz—is what Senator McCain’s June 14, 2005 reference (see footnote 34 *infra*) denotes.

<sup>29</sup> Very High Frequency (VHF) bands: 54 – 72 MHz (ch. 2-4); 76 – 88 MHz (ch. 5-6); 174 – 216 MHz (ch. 7-13). Ultra High Frequency (UHF) bands: 470 – 608 MHz (ch. 14-36); 614 – 806 MHz (ch. 38-69).

<sup>30</sup> *9/11 Report*, fn. 8 *supra*, p. 317.

<sup>31</sup> National Cable & Telecommunications Association, [Industry Overview](#), 9/15/05.

<sup>32</sup> *Id.*

<sup>33</sup> [Commission Adopts Rules for Digital Television Service](#) (MM Docket No. 87-268), FCC News, Apr. 3, 1997. The [full text](#) of the FCC’s original ruling, In the Matter of Advanced Television Systems and Their Impact on the Existing Television Broadcast Service, Fifth Report & Order, MM Docket 87-268, adopted Apr. 3, 1997. The FCC conducts periodic reviews of the DTV transition, the most recent in 2003. [In the Matter of Second Periodic Review of the Commission’s Rules and Policies Affecting the Conversion To Digital Television](#), MB Docket No. 03-15, adopted Apr. 28, 2003.

<sup>34</sup> The bill’s full tongue-twister title is: Spectrum Availability for Emergency-Response and Law-Enforcement to Improve Vital Emergency Services Act. The text of S..1268 (the latest version, introduced June 20, 2005) is found [here](#). Senator McCain’s [June 14 press release](#) specifies that 24 MHz of spectrum is desired.

<sup>35</sup> Hazlett, Thomas W., [Tragedies of the Telecommons](#), ft.com, April 18, 2003.

<sup>36</sup> Hazlett, Thomas W., *The U.S. Digital TV Transition: Time to Toss the Negroponte Switch*, AEI/Brookings Joint Center Working Paper 01-15 (Nov. 2001). The “Negroponte Switch” in Hazlett’s title refers to a suggestion by digital maven Nicholas Negroponte of MIT in the late 1980s, *i.e.*, that as fiber and wireless are deployed ubiq-

uitously traffic once carried by wire (voice) will migrate to data while traffic once carried over-the-air (TV) will migrate to wire.

<sup>37</sup> *Id.*, p. 12, fn. 28.

<sup>38</sup> Hazlett, Thomas W. & Muñoz, Roberto, *The Digital TV Transition*, Testimony before U.S. Senate Commerce Committee (June 9, 2004).

<sup>39</sup> *Telecommunications Policy Review* (private newsletter), pp. 3-5, Vol. 21, No. 37 (Sept. 11, 2005).

<sup>40</sup> *A Better Communications System for Emergency Workers*, fn. 23 *supra*.

<sup>41</sup> Thus, after the first WTC bombing firefighters were furious that police rescued people from the roof, deriding it as a dangerous stunt. See *102 Minutes*, fn. 16 *supra*, at pp. 130-34.

<sup>42</sup> Source: private conversation with a member of the team AT&T brought in to find the software bug. The glitch was an erroneous punctuation mark that created a software logic "AND" condition where a logic "OR" condition was intended. The result, under certain traffic conditions, was that an SS6 switching module would simultaneously "think" the switch was able to accept more traffic and also unable to. The first module "went insane" and took itself off the network. But before it did so it passed the erroneous reading of its condition to the next switch, which repeated the process. The failure cascaded through 114 SS6 modules in 19 minutes, with a switch crashing every ten seconds. (SS6 is Signal-

ing System 6, Common Channel Inter-office Signaling, the first telephone network signaling system to feature signaling channels separate from the channels carrying customer traffic.)

<sup>43</sup> *Phone Networks Fail Once Again In a Disaster*, Wall Street Journal, p. A19 (Sept. 6, 2005).

<sup>44</sup> *Behind Poor Katrina Response, a Long Chain of Weak Links*, Wall Street Journal, p. A1 (Sept. 6, 2005)

<sup>45</sup> [New Lines of Communication: Some Want to Scrap the Old Infrastructure To \[sic\] Create a High-Tech, Wireless Region](#), Washington Post, Sept. 16, 2005.

<sup>46</sup> The Los Angeles Times reported that officials in the Louisiana Office of Homeland Security and Emergency Preparedness were indicted for failing to account for \$60 million of FEMA funds for 1998-2003. In March 2005 FEMA demanded \$30.4 million back from the state, after a federal investigation found that funds intended for flood assistance were diverted. The state says everything has been cleaned up; the feds dispute this. [Louisiana Officials Indicted Before Katrina Hit](#), Los Angeles Times, Sept. 17, 2005.

<sup>47</sup> Steyn, Mark, [The Big Easy rocked, but didn't roll \[sic\]](#), Daily Telegraph, 9/6/05.

<sup>48</sup> Ross, Patrick, [Looks Like They Were Right](#), Progress & Freedom Foundation Blog, 9/15/05.

<sup>49</sup> Winchester, Simon, [Before the Flood](#), New York Times, 9/8/05.

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