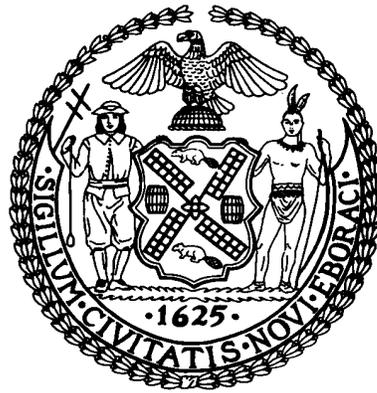# THE COUNCIL OF THE CITY OF NEW YORK

August 2002

"TECHNOLOGY LESSONS LEARNED FROM NEW YORK CITY'S RESPONSE TO 9/11"

A Report from:

THE SELECT COMMITTEE ON TECHNOLOGY IN GOVERNMENT

Hon. Gifford Miller, Speaker
Hon. Gale A. Brewer, Chair

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The Select Committee on Technology in Government

Hon. Gale A. Brewer, Chair
Summary of Activities

Few would disagree that New York City government can and should make better use of information technology to save money, improve City services, and bring citizens in closer touch with their government and communities. However, technology has its downsides, too. Lower income neighborhoods generally have less access than upper income neighborhoods. Privacy concerns – particularly for those going online in public places – deter some users from availing themselves of the full range of online services. From an agency perspective, simply planning for and purchasing the right equipment is always challenging, especially in the present budgetary environment.

Given the promise and potential pitfalls of information technology, the Select Committee on Technology in Government has focused its five hearings to date on examining the City's various e-government efforts by the threefold criteria of efficiency, openness, and community access.

Prior Hearings

- **April 11, 2002** - *(Joint)* "Strategies to Strengthen Small Business in New York City Post 9/11"

- **April 15, 2002** - "Using Technology to Make Government Smart, Cost Effective, and Open"

- **April 23, 2002** - "Creating an Online Educational Community: Recent Initiatives from the Board of Education's Committee on Technology"

- **May 6, 2002** - "Technology Lessons Learned from New York City's Response to 9/11"

- **June 24, 2002** - "A Review of New York City's E-Government Initiatives"

- **July 26, 2002** - "*Tour* of Critical E-Government Facilities"

Select Committee Hearing Documents Now Online

All Briefing Papers, Hearing Programs, and Compiled Testimony documents from Select Committee hearings are available online. The documents can be found at the City Council's website (www.council.nyc.ny.us) in the "Hearings and Meetings" or "Committee" section. Simply go to the date of a Select Committee hearing and you will be able to view and download the relevant documents.

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The Select Committee on Technology in Government is pursuing an ambitious agenda that will touch upon a broad range of government activities and services, in many cases attempting to address complex issues that cut across many agencies. Working jointly with other Council committees where appropriate, we expect that the Select Committee will seek to identify and push for implementation of technology that will lead to better and more cost effective services in areas such as the following: a more streamlined procurement process; better management of relationships between human services clients and the myriad City and nonprofit agencies that serve them; better processing, adjudication, and enforcement of violations issued by regulatory agencies; and more efficient and open processing and issuance of licenses and permits. In addition to service delivery issues, the Select Committee intends to tackle the question of how all branches of government – including the Council itself – can use the Internet and other electronic media to make government more open and informative of our activities and the policy choices we make. Finally, a high priority of the Select Committee will be to ensure that all segments of our communities have access to technology that is essential for full participation in the government and economy of the Twenty-First Century.

If you have any questions or comments on any of the above, or if you would like to be placed on the Select Committee's email list, please contact Chairperson Gale A. Brewer at 212.788.6975 or gale.brewer@council.nyc.ny.us, or contact the Select Committee's Policy Analyst, Nick Noe at 212.788.4301 or infnoe@council.nyc.ny.us.

Introduction

"The challenge that City government now faces is the ability to undertake a strategic opportunity, in light of its competing priorities, to design and deploy a more resilient or perhaps fail-safe telecommunications environment, supporting both voice and data communication for critical City government operations."

- Avi Duvdevani, Former Acting Commissioner, DoITT

The events of September 11 had a devastating impact on New York City's telecommunications infrastructure. By the time Verizon's central switching office at West Street was damaged beyond operation at 5:20 P.M., 300,000 voice lines, 4 million data circuits affecting 14,000 businesses and 20,000 residential customers, and as many as 50,000 telephones on the desks of City employees had been disabled. One Police Plaza, FBI headquarters, the court system, scores of municipal, state, and federal agencies clustered in Lower Manhattan, and the Office of Emergency Management went dark – both in terms of communications capacity and electrical power. Moreover, evacuations, combined with the establishment of several restricted access zones up to 14 Street left many City facilities and vital commercial institutions like the New York Stock Exchange, inaccessible, and in varying degrees, inoperable.[1]

Despite the unprecedented technology challenges facing numerous municipal operations, the Department of Information Technology and Telecommunications (DoITT) and the Office of Emergency Management (OEM) were quickly able to prioritize recovery operations, move staging locations, and then recreate or, in some cases, completely redesign mission-critical Information Technology (IT) and Telecommunications systems. In a testament to the importance of prior planning and flexible thinking, the City's IT coordinators – especially DoITT's Alan Leidner, Avi Duvdevani, and Brian Cohen, among many others – accomplished this seemingly Herculean task by activating pre-established public-private coordinating committees, employing innovative Internet-based technology solutions, and applying several protocols developed through the City's extensive Y2K planning effort. As a result, the City successfully maintained and expanded its vital web portal, NYC.GOV, prevented widespread agency data loss, reconnected key government facilities, including the Mayor's Office and the Municipal Building, and, in short order, built several emergency response staging facilities and applications in previously empty pier space – all done with the assistance of a devoted staff of City employees, volunteers, and contractors.[2]

With competition increasing in the local telecommunications market and with DoITT contemplating a major telecommunications overhaul,[3] New York City as a whole is presented with unique opportunities to make substantial investments based upon the numerous technology lessons learned through the public and private sector's response to 9/11 – especially, though not exclusively, in the area of telecommunications infrastructure. From the installation of fiber optic, redundant telephone and data networks – away from a reliance on closely clustered copper lines prone to single point outages – to the encouragement of wireless and Internet-based telecommunications solutions, the City of New York, the Lower Manhattan Development Corporation, and the general public must strongly pursue, encourage, and, where appropriate, demand that such technology investments are made in a timely fashion – not just in the

50,000 City Government Telephones Disabled
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26 Municipal Buildings Inaccessible

DoITT and OEM Respond With Innovative Technology Solutions

Unique Opportunity for Redesigning City's Telecommunications System

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[1] "Disaster Takes Its Toll on Public Network," Information Week, September 17, 2001, p. 96

[2] "Technology Team on the Front Lines in New York City," Amy Spinetta, Government Technology,

[3] "Leaders Emerge for NYC BCP Solutions," Securities Industry News, April 8, 2002, p.2

immediate area of the World Trade Center site or near City Hall, but across the five boroughs.

Key Terms

Telecommunications:
"*Diversity* involves establishing physically different routes into and out of and a building, and different equipment so as to better ensure continued operations in the event that one route or network is impacted adversely by a disaster or other form of interference."

"*Redundancy* involves having extra capacity available, generally from more than one source, and also incorporates aspects of diversity. Not only does redundancy entail having capacity in reserve to handle sudden increases in demand or partial outages, but it also entails securing service from more than one provider where practicable. The use of multiple providers increases the probability that service will be maintained or restored in the event of a disaster, emergency, or carrier-specific problem, and decreases the chances that all communications capabilities will be affected in the same way at any given time. It ensures the availability of two distinct workforces to serve the customer and the opportunity to try two different approaches to solve a common or related problem."

- Larissa Herda, Chairman, Time Warner Telecom[4]

Information Technology:
"Hot Sites" house duplicate, ready-to-go network infrastructure, hardware, software, and data at a location geographically distinct from an organization's central facility.

"Cold Sites" provide an organization with empty space that is suitable for installing network infrastructure, hardware, and software. Climate control (HVAC) and interior architecture (like raised floors) are key determinants for establishing a cold site.

The City Has Completed a Hazard Mitigation Plan That Invests in the Technology Lessons of 9/11

In an important step towards making the kinds of investments that proved vital in keeping the City up and running after 9/11, DoITT, in conjunction with OEM, recently submitted a comprehensive Hazard Mitigation[5] proposal to the State of New York for ultimate consideration by the Federal Emergency Management Agency (FEMA). According to Avi Duvdevani, the Acting Commissioner of DoITT after 9/11,[6] the City's application is focused, in part, on "creating specific, diversified telecommunications network design solutions that will serve to mitigate significant risk to public safety, public service, and financial loss to the City of New York, in the event of a hazard."[7] DoITT and OEM have also identified several IT related Hazard Mitigation initiatives that are intended to serve as vital complements to the application's overall focus on the City's telecommunications infrastructure. These items include: building a comprehensive Geographic Information System (GIS) for emergency scenarios, such as was developed and used by numerous emergency responders and planners after 9/11 (see below); the identification and integration of strategic data within existing City databases; the development of Global Positioning System (GPS)

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[4] "Statement by Larissa Herda, President and CEO Time Warner Telecom," Federal Document Clearing House Congressional Testimony, March 6, 2002
[5] "Transcript of the Minutes of the Select Committee on Technology in Government," City Council of the City of New York, May 6, 2002; According to FEMA, the Hazard Mitigation program is dedicated to "promoting multi-hazard mitigation to protect people, property, and infrastructure from future disasters."
[6] Incredibly, Avi Duvdevani became Acting Commissioner of DoITT on 9/11
[7] "Transcript of the Minutes of the Select Committee on Technology in Government," City Council of the City of New York, May 6, 2002

capabilities for field forces; and the development of handheld computers and data collection templates for inspectors and emergency responders.

Sadly however, while FEMA has belatedly expanded the Hazard Mitigation program's guidelines to include "Information Technology or Telecommunications (ITT) projects,"[8] the agency has limited the definition of qualifying projects to "redundancy" or "security system" initiatives.[9] Unfortunately, these two categories fail to fully capture the range of ITT projects, outlined briefly above, that, after 9/11, we now know the City must implement if the impact of future disasters is to be avoided or adequately mitigated. In fact, according to a March 12 directive from FEMA, GIS mapping, database centralization efforts, and GPS systems, among many other IT related systems, are currently "<u>ineligible</u>" to receive Hazard Mitigation funding.[10] In short, by only considering "redundancy" or "security system" initiatives, FEMA appears to be perpetuating its much-criticized tendency to narrowly define the scope of its financial support for New York City[11] – a perception reinforced by President Bush's directive to FEMA, in October 2001, to reduce its contribution to Hazard Mitigation projects in New York State from 15 percent to only 5 percent of FEMA's total 9/11 New York grants. Despite the State's appeal of the decision, which cited the lack of <u>any</u> precedent for reducing the contribution rate, FEMA appears unlikely to restore the program's historical contribution rate of 15 percent and has denied outright the State's request for increasing the rate to 20 percent.[12]

FEMA Has Narrowly Defined the ITT Portion of the Hazard Mitigation Program and Unfairly Reduced Their Rate of Contribution

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[8] On July 29, 2002, FEMA acknowledged, in a letter to the City Council, that the Hazard Mitigation program would in fact cover some ITT projects related to the terrorist attacks. However, as of August 1, 2002, FEMA's website still limited the Hazard Mitigation program to "natural disasters" only – "The purpose of the program is to reduce the loss of life and property due to natural disasters and to enable mitigation measures to be implemented during the immediate recovery from a disaster declaration" (see www.FEMA.GOV). Moreover, according to this criterion, eligible projects must be focused on "the acquisition or relocation of property located in high hazard areas; elevation of floodprone structures; seismic rehabilitation of existing structures….", in short, non-technology related projects.

[9] According to FEMA's letter to the Council, FEMA will "consider funding these ITT portions of projects if they are necessary parts of a redundant system… Also, we would consider funding ITT portions of comprehensive, fully integrated security system designs where the security measure addresses a terrorist or natural hazard threat that has the potential for substantial harm to property and life." Letter from Michael J. Widomski, External Affairs, FEMA to NYC Council, July 29, 2002

[10] FEMA-DR-1391-NY, March 12, 2002.

[11] Since 9/11, FEMA has been repeatedly criticized for narrowly defining the eligibility guidelines of various programs that were intended to help New York City recover from the WTC disaster. FEMA's Mortgage and Rental Assistance Program drew particular ire after it was reported that the program had rejected almost 70% of the more than 10,000 applicants for assistance because the agency limited benefits only to those who could prove that their lost income was a "direct result" of the attacks, or "related to the physical damage caused by the disaster," – two very different standards from those which have traditionally governed disaster relief efforts. Indeed, after a <u>New York Times</u> article and Congressional criticism, FEMA changed its eligibility guidelines to cover any applicant who "suffered financially because of the attacks" and lived or worked in Manhattan. FEMA was also criticized for narrowly defining the eligibility guidelines of its Disaster Unemployment Assistance program, which denied help to several categories of workers in Lower Manhattan. Finally, FEMA was taken to task by New York's Congressional delegation for failing to reimburse private nonprofit groups for 9/11 related costs as well as for failing to reimburse area schools for lost instruction time. "Feds Extend Sept. 11 Aid," Daily News, June 29, 2002, p. 8; "FEMA's Pace On 9/11 Aid Is Criticized," <u>New York Times</u>, June 14, 2002, Section B, p. 1; "Change in Rules Barred Many From Sept. 11 Disaster Relief." <u>New York Times</u>, April 26, 2002, Section A, p.1

[12] Letter from Theodore Monette, Jr. Federal Coordinating Officer to Edward F. Jacoby, Governor's Authorized Representative, NYS, October 22, 2001. According to Mr. Jacoby's letter, "There is no precedent for reducing HMGP funding from 15% to 5%… <u>With the severity of this event, I expect the</u>

Although the precise contents of the City's Hazard Mitigation plan have not been made public, by submitting an application the City has taken an important step towards planning for and making the kinds of investments that will provide greater security and efficiency for our entire City's telecommunications system – not just that of City government. Now it is up to FEMA to act by restoring the historical contribution rate for Hazard Mitigation projects and expanding the scope of eligible ITT projects. As a first step in this effort, FEMA should also finally reimburse the City for over $30 million in 9/11 IT expenditures that, as of July 2002, were still in the process of being approved:[13]

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FEMA Should Fund NY's Hazard Mitigation Projects at the Full Rate and Expand the ITT Guidelines

FEMA Still Owes NYC Over $30 Million in 9/11 IT Expenditures

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Original Request	Status	Agency	Description
$ 287,581.72	Not Obligated - In Process	Housing and Preservation Development	X/O entrance costs
$ 618,828.00	Not Obligated - In Process	Dept of Corrections	Pc's, network, voice, relocation of people
$ 123,472.50	Not Obligated - In Process	Fire Department	Radio batteries
$ 4,476,319.50	Not Obligated - In Process	Fire Department	Radios
$ 743,749.00	Not Obligated - In Process	DoITT	Nortel Equipment
$ 1,395,099.00	Not Obligated -In Process	DoITT	OSP work from Worldcom
$ 1,388,123.00	Not Obligated -In Process	DoITT	Cisco Citynet equipment
$ 10,000.00	Not Obligated - In Process	Fire Department	Telephone lines at WTC site
$ 2,793,500.00	Not Obligated- In Process	Dept of Health	Pc's, network, voice, relocation of people
$ 4,642,768.00	Not Obligated - In Process	Office of Management and Budget	New computers, relocation, 1.1 M for Xerox equipment
$ 4,900,000.00	Not Obligated - In Process	DoITT	Additional radio equipment, 1644 portables
$ 6,335,739.00	Not Obligated - In Process	Office of Mayor	Computer, network, telephony
$ 3,000,000.00	Not Obligated - In Process	Dept of Law	New computers, networking equipment
$ 668,000.00	Not Obligated - In Process	Office of Emergency Management	Computers, video, telephone, labor etc.

In addition to realizing a comprehensive IT Hazard Mitigation plan, the City should also encourage greater competition and real redundancy in the local telecommunications market so events like the partial destruction of Verizon's West Street switching office have less severe repercussions for the public and private sectors. Since the City spends almost $90 million each year on its own telecommunications services provided now through Verizon[14] and is currently in the process of issuing a Request For Proposal to upgrade this system, the City has a unique opportunity to do just that. Indeed, by promoting multiple carrier arrangements, the convergence of voice and data systems through Internet Telephony, and wireless data networks – in short, strategies which the City employed successfully after 9/11 – the City would not only build greater redundancy and diversity into our own municipal telecommunications networks; it would also stimulate the buildout of a more diverse, flexible telecommunications platform for businesses and individuals in Lower Manhattan and beyond[15].

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Encourage Greater Network Diversity and Redundancy

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mitigation needs of New York City to again be in excess of the funding available. A 5% limit will only exacerbate this [emphasis added]."

[13] Table provided by FEMA June 4, 2002 – Updated on July 29, 2002

[14] "The Mouse as Sacred Cow," New York Times, Jennifer Steinhauer, May 28, 2002, Section B p.1

[15] According to published reports, the City of New York is preparing an RFP for upgrading the City's IT and telecommunications systems and has been in discussion with alternate telecommunications providers such as Con Edison Communications. "Leaders Emerge for NYC BCP Solutions," Securities Industry News, Shane Kite, April 8, 2002; "The Mouse as Sacred Cow," New York Times, Jennifer Steinhauer, May 28, 2002, Section B p.1

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The report that follows below grew out of the Select Committee on Technology in Government's May 6, 2002 hearing entitled *"Technology Lessons Learned from New York City's Response to 9/11*," as well as subsequent staff research. The report summarizes the heroic and innovative efforts that the City's IT personnel, extended volunteer community, and IT/telecommunications companies coordinated almost immediately after the first plane hit the World Trade Center. By examining the tactics employed, the Select Committee arrived at several recommendations that we believe can serve as a blueprint for hazard mitigation as well as ongoing operational practices. Given the City's anticipated budget shortfalls as well as the continued threat of terrorist attacks, we hope that these recommendations will indeed provide an impetus for building a more robust, secure, and cost-effective technology infrastructure that City agencies, businesses, and the public can rely on before, during, and after emergencies.

"A Diving Catch in the Last Minute of Play[16]"

The partial destruction of Verizon's central switching office on West Street on the afternoon of 9/11, combined with multiple wireless and wireline transmitter losses immediately after the towers' collapse, precipitated an unprecedented citywide and regional telecommunications breakdown that had already been set in motion after communications traffic surged to record levels shortly after the first plane struck the World Trade Center. On 9/11, Verizon's local traffic doubled to 340 million calls in Manhattan alone, with 431 million long-distance calls (up from a typical 300 million).[17] Both attacks immediately incapacitated 11 wireless transmitters serving Lower Manhattan, while Con Edison lost five of seven feeder cables south of Canal Street causing widespread blackouts. By the time Verizon's central office at West Street was damaged beyond operation at 5:20 pm on the 11th, 300,000 voice lines, four million data circuits affecting 14,000 businesses and 20,000 residential customers, and as many as 50,000 telephones on the desks of City employees had been disabled. One Police Plaza, FBI headquarters, the Court system, and OEM (who had already been forced to evacuate its command center at 7 World Trade), also went dark – both in terms of communications capacity and power.[18] By the late afternoon, authorities had also established a series of restricted access zones up to 14 Street that remained in effect, in some cases, for months after 9/11.

With 26 municipal buildings in the immediate and surrounding area of ground zero, the telecommunications and power outages, combined with the inaccessibility of the area, presented a daunting challenge to City workers who were called on to quickly reestablish some of the City's most basic functions – not to mention absolutely vital emergency operations.[19]

Unfortunately, although the City's Y2K planning had accounted for power outages, computer failures, and a certain degree of telecommunications disruptions, the planning had not accounted for the need to move the physical location of various agency operations. According to a March 8, 2002 report from the Gartner Group, a private sector research company, "Planning for total neighborhood and facility disasters and widespread telephone outages were not covered in New York City's Y2K plans.[20]" Perhaps even more problematic was the fact that the City's Y2K plan itself could not be retrieved from 100 Church Street – a building declared unsafe for entry in the days following 9/11. DoITT hurriedly contacted city agencies to ask if they had their individual plans available and the update status of those plans but, amazingly, found that some agencies were "missing" their plans. Although DoITT was able to reconstruct many of the plans with assistance from IBM, the inaccessibility – and loss – of key

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[16] "A Nation Challenged," New York Times, October 8, 2001, Section B, p.13. The quote is excerpted from comments made by Paul Crotty, Verizon's group President in charge of the recovery effort, in regards to Verizon's effort to reopen the stock market.
[17] "Disaster Takes Its Toll on Public Network," Information Week, September 17, 2001, p. 96
[18] "A Nation Challenged: Communications," New York Times, October 8, 2001, Section B, p. 13; "No Time to Grieve," Darby Patterson, Government Technology, February 2002; "Technology Team on the Front Lines in New York City," Amy Spinetta, Government Technology, September 14, 2001; "Review of Computer Security at Government Agencies," Transcript of the House Government Reform Committee, September 26, 2001, pp.1-5
[19] "Challenges in Information Technology After 9/11," CATT Panel Summary, David Goodman
[20] "The Role of the New York City Portal After 9/11," The Gartner Group, p. 3

disaster recovery documents further reinforces the limitations of relying on Y2K planning as the City's premier disaster response strategy – and, as the Gartner report concluded, the need for Continuity of Business plans to be regularly updated to match changing conditions.

<div style="float:left; border:2px solid black; background:#6ca0dc; padding:8px; text-align:center;">
City Agencies
Needed, But
Did Not Have,
Hot or Cold
Sites
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While the destruction of OEM's Command Center at WTC 7, and its two subsequent relocations, provided perhaps the most frightening indication of the limitations of the City's prior disaster planning, the Health Department's experience after the attacks is perhaps more instructive, though less sensational, as it highlights the twin problems of displacement and inaccessibility experienced by many City agencies. As Edward Carubis, the Assistant Commissioner for Management Information Services at the Department of Health testified,

> "While the Department lost no data due to the attack, we did lose use of four downtown Manhattan facilities including our headquarters, which required redeployment to other buildings not configured to serve either emergency or routine functions, nor to accommodate the numbers of staff dislocated. While Department staff were successfully reallocated and relocated to sites that did have data communication services, the lack of off-site spare, redundant equipment meant we could not immediately 'bring up' some of those services, and thus employees could not work with the data that did exist. This was because the Department did not have, waiting in the wings and accessible, the needed equipment, either already wired up or ready to hook up, respectively termed in our business, 'hot' and 'cold sites' that would make the data available and usable at a new location.[21]"

<div style="float:left; border:2px solid black; background:#6ca0dc; padding:8px; text-align:center;">
Backup Data Tapes:
Hard To Access &
Dangerous to
Transport
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Moreover, though City agencies regularly backed up data as a consequence of Y2K planning, many agencies failed to store the physical tapes off-site, compounding the challenges of physical displacement. As the Gartner report explains, an important lesson learned was that backup tapes were often "not easily accessible for the recovery process after September 11 because the building that housed the backup tapes was also involved in the events and, therefore, … was not accessible. Alternatively, the tapes were not offsite and during evacuation, no one took them out of the building."[22] Attempts to "bring back up" critical databases and applications at sometimes makeshift sites were therefore further complicated when, according to the Gartner report, "some agencies were concerned that they would lose their only set of backup tapes while in transit to the recovery site."[23] In order to safely restore data operations, some agencies were therefore forced to add tape duplication to their disaster recovery service contract – a move that increased the cost and duration of recovery operations.

<div style="float:left; border:2px solid black; background:#6ca0dc; padding:8px; text-align:center;">
DoITT Addressed
Many Telecom
Issues Without
Main Providers
Assistance
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Beyond the unanticipated problems of physical displacement and safe accessibility, the City's Y2K planning had also not accounted for the destruction of a main switching facility like Verizon's West Street building. As Avi Duvdevani put it, "Basically, we were pretty well positioned for disaster except for this one piece. It was not included in disaster planning."[24] Moreover, due in part to the President's directive to get the Stock Exchange back up and running, Verizon was heavily focused on recovery operations at West Street and the financial sector as well as OEM and Police Headquarters – not on restoring mission critical government operations (identified

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[21] "Transcript of the Minutes of the Select Committee on Technology in Government," City Council of the City of New York, May 6, 2002
[22] "Tactical BCP Lessons Learned from Sept. 11," The Gartner Group, pp. 1-2
[23] Ibid.
[24] "IT in the Ruins," Governing Magazine, November 2001, p. 38

through Y2K planning) like City Hall and the Municipal Building. "As a consequence," Avi Duvdevani testified, "DoITT could not solely rely on Verizon…to be an early participant in restoration activities for other City government locations."[25]

Unfortunately, despite the solutions that the City's IT workforce formulated in response to the telecommunications crisis, many agency operations, especially those that needed to communicate with external entities, were not able to escape the damage to Verizon's network and were therefore disabled for weeks and even months after the attack. The Women's Housing and Economic Development Organization (WHEDCO) – a social services group that hires and trains women on welfare – was one of those external entities that sustained no physical damage but was unable to function because computers at the Human Resource Administration (HRA) were unable to communicate for a sustained period of time. Because of this, WHEDCO, which gets paid per client from HRA, was not sent new trainees for weeks after the attacks and was forced to reduce services and forgo critical revenue.[26] Indeed, according to Dennis Fecci, Deputy Commissioner at HRA, "one-third of the HRA remote facilities lost their connectivity with our data center at 111 Eighth Avenue. This was because of the collapse or the problems with the phone company central offices."[27]

However, despite the effects of the West Street failure, the patchwork of technology solutions devised and implemented by DoITT and other City agencies did manage to restore many critical municipal functions within a relatively short period of time. As Mr. Fecci explained further,

"We also had three large sites that had lost connectivity and luckily they had line of site to facilities that were operational and had excess band-width. So, we set up wireless data transfer operation between the sites with excess band-width to those sites that did not have connectivity and that worked very, very well."[28]

As is described in greater detail below, quick thinking like this eventually even led DoITT to Bankruptcy Court so the City could reactivate a defunct wireless network in Lower Manhattan as a means for reconnecting several municipal buildings to email and the Internet. Without these kinds of technologically adept solutions from the personnel at HRA, DoITT and many other agencies, the City would almost certainly have lost its Internet Portal, NYC.GOV for an indeterminate period of time and probably would have sustained far more damaging, long-term telecommunications outages at crucial municipal facilities and recovery sites. Such failures would have also undoubtedly increased the costs associated with 9/11 and, more significantly, further impeded the painful process of rescue, recovery, and rebuilding. Of course, even while advanced technology seemed to power the City forward in its response to 9/11, more rudimentary efforts as basic as *finding and transporting* redundant Geographic Information System (GIS) datasets to OEM's field office, came to play a vital role as well in aiding and enabling the recovery and reconnection effort that quickly followed the attack.

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[25] "Transcript of the Minutes of the Select Committee on Technology in Government," City Council of the City of New York, May 6, 2002

[26] "Making the Change: Unfinished Business," Alyssa Katz, City Limits, December 2001

[27] "Transcript of the Minutes of the Select Committee on Technology in Government," City Council of the City of New York, May 6, 2002

[28] Ibid.

Recovering, Reconnecting, and Reconfiguring

Perhaps the most significant technology lesson learned after 9/11 was the greater durability and usefulness of the Internet compared to the traditional telephone network. According to Brian Cohen, a Deputy Commissioner at DoITT, "We'd never thought we'd lose the phones. But when we lost the phones, we still had the Internet. IT became a whole new medium of communication."[29] Indeed, with cellular customers experiencing significant delays in the metro area and with widespread telephone service outages that lasted, in some areas, for almost two months, many City operations, especially emergency services, turned to the World Wide Web, text-messaging, and the Internet as a whole for fast, reliable solutions to various communications and information management problems.

A significant reason for this, identified by municipal and private sector experts,[30] lies in the basic architecture of the Internet. Unlike the copper based, point-to-point configuration of the telephone network, the Internet breaks information, voice or data, into separate packets that are then carried to an address through multiple pathways instead. If one packet experiences a delay, it is re-routed through another, more efficient avenue. Once all the packets have arrived, the information is assembled and represented whole, as it was before it was sent. Through packet switching, information therefore becomes more "delay-tolerant," unlike a telephone communication that travels as a single entity from one point to another.[31]

Given this resiliency, it is not surprising then that one of the most critical components of the City's response to 9/11 proved to be its website – NYC.GOV. Shortly after the first plane hit, Acting Commissioner Duvdevani took NYC.GOV down in order to both restrict access to sensitive information as well as to redesign the website to serve as the focal point for information on the disaster. By 10:30 am, with coordination from the Mayor's Office of New Media, the new website was carrying emergency information, public hotlines and an online form for donations of emergency supplies. However, after Verizon lost its West Street station, the City's own Internet Service Provider, Applied Theory, lost a major Point of Presence (POP),[32] forcing DoITT to search for an alternate carrier. At 10:30 P.M. on the evening of 9/11, just as DoITT was implementing a server change to find additional POPs, NYC.GOV went completely down, disabling City email, Internet connectivity, as well as the site itself. DoITT quickly identified another Applied Theory POP; key staff put on protective gear and went into the disaster area to physically link the City's own fiber-optic network, called the I-Net, to the POP at the new location.[33]

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[29]"No Time to Grieve," Darby Patterson, Government Technology, February 2002

[30]"Challenges in Information Technology After 9/11," CATT Panel Summary, David Goodman

[31]"Disaster Takes Its Toll on Public Network," Information Week, September 17, 2001, p. 96

[32] POPs are facilities that route Internet traffic for Internet Service Providers – most ISPs have multiple POPs.

[33] "No Time to Grieve," Darby Patterson, Government Technology, February 2002; DOITT defines the City's I-Net as, "... a high capacity fiber optic based facility serving across four boroughs. The I-Net consists of multiple OC48 fiber rings, that provide high quality videoconference systems serving the Board of Education Citywide Training Network (CTN), the City's Court Judicial Systems (CJS) and connections for computer systems operations and CityNet" (see DoITT website at www.NYC.GOV). Essentially, the I-Net is the conduit through which much of the City's government data travels – at speeds

Ultimately, NYC.GOV proved to be an enormously important and efficient means of communicating with the general public. Indeed, prior to the September 11th disaster, an average day would yield approximately 350,000 page views on NYC.GOV. On September 14th, 2001, 1.66 million page views were received as the public became aware through the media that NYC.GOV contained the most timely, accurate and official information regarding the disaster and available services. According to the Preliminary Fiscal Year 2002 Mayor's Management Report (PFY2002 MMR), during the first four months of Fiscal 2002 (July 2001 – October 2001) NYC.GOV received approximately 39.4 million page views, compared to 14.7 million for the same period of Fiscal 2001. In addition, the month of September 2001 averaged 19.1 million page views, compared to 5.2 million for September 2000.[34]

While securing the City's website, DoITT worked simultaneously to restore telecommunications and data services for scores of municipal agencies, the Mayor's Office, and the Municipal Building. From its headquarters at Metrotech in downtown Brooklyn, DoITT staff worked around the clock shifts to reconnect the 3,000 terminals and 120 business-critical application systems operated through the Metrotech facility for the Departments of Finance, Criminal Justice and Buildings, among others. Here especially, the City's Y2K plan turned out to be vital in guiding the effort since a key component of the plan had been to rank government services in order of importance. Consequently, DoITT had a clear list of priority facilities to reconnect from the beginning of the disaster.

With Verizon focused on enabling emergency telecommunications services and getting the Stock Exchange back up, DoITT quickly activated the Mutual Aid and Restoration Consortium (MARC)[35] as the primary vehicle for bringing alternate telecommunications carrier services to office buildings housing City agencies. Established in 1992, MARC functions as a public/private initiative comprised of the telecommunications carriers serving the New York City metropolitan area whose members have agreed to cooperate to restore services in times of catastrophic failure. Twice daily teleconference meetings with MARC members and non-MARC members with telecommunications assets in the City were held after the attacks by DoITT in order to organize restoration of voice and data services to City government buildings. Priority restoration sites were identified, in part through the City's Y2K plan, and alternate carriers with the greatest ability to bring service to these buildings quickly and efficiently were identified. Restoration work then began immediately. As Deputy Mayor Joseph Lhota explained, without MARC, "We could not have known that we could go to a cable company and get telephony."[36]

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far in excess of what cable, DSL, or T-1 lines can offer. Significantly, the I-Net has the capability to offer high quality videoconferencing, voice and data transmissions on one system.

[34] Preliminary Fiscal 2002 Mayor's Management Report, February 28, 2002

[35] The MARC agreement was signed February 18, 1992, by the American Telephone and Telegraph Company, Cable & Wireless Communications, Inc., Eastern Microwave Inc., Litel, Local Area Telecommunications, Inc. (LOCATE), MCI Telecommunications Corporation, Metropolitan Fiber Systems of New York, Inc., New Jersey Bell Telephone, New York Telephone Company, RCI Network Services, Inc., Teleport Communications, US Sprint Communications Company Limited Partnership, Western Union ATS, Inc., WilTel, and the City of New York.

[36] "Hands Across IT Borders," Darby Patterson, Government Technology, January 2002

Indeed, as a consequence of the MARC collaboration, combined with the need to respond to widespread telephone outages, DoITT turned to two innovative telecommunications solutions, in particular, which reconnected critical elements of the City's voice and data network. The first such solution was the use of Internet Telephony, or Voice Over Internet Protocols (VoIP), which allowed DoITT to run voice communications through underground fiber-optic lines often separate from Verizon's damaged system. This system effectively leveraged the redundancy and diversity of the Internet's fiber-optic backbone to the benefit of telephone communications. By using the City's own fiber (I-Net) as well as various telecommunications provider fiber (Time Warner Communications is one example), DoITT was able to circumvent Verizon's damaged network and deliver telephone service as well as data service. In fact, as DoITT quickly discovered, Internet Telephony delivered multiple benefits over the traditional telephone network since: it allowed specific phone lines to move physical locations without necessitating new number assignments, it did not rely on a single line for communication, and "all-in-one" workstations (with voice and data on the same network) could be set up on one system. City Hall's phone service was thus effectively restored in three days with an Internet Telephony network that allowed staff members to plug in a phone to any Internet jack and maintain a constant number and voicemail no matter where the phone was sited (since the address, the IP number in effect, remained the same). With conventional telephony, such a process would have taken days and incurred significant additional costs.[37]

DoITT also used high-speed wireless transmitters to connect various buildings to the City's network. At a cost of approximately $38,000 per unit, City Hall, the Municipal Building, and the City Council at 250 Broadway, all reconnected to their parent networks for Internet connectivity, email, and data sharing by operating wireless transmitters placed on top of the respective buildings. Connectivity was further supplemented by the use of the wireless Ricochet Inc. network that the City reactivated with the permission of Bankruptcy Court[38]. By using these wireless networks, DoITT was thus able to restore data service to several City agencies in a timely and cost-effective manner. As Duvdevani explained in relation to the multiple telecommunications solutions employed by the City,

> "If there can be a positive side to such a horrific event, it is that alternate carrier service, including an alternate for the local loop was quickly put into place in a number of buildings housing mission critical City government functions… A key benefit of those alternate communication services to City government is that critical telecommunication services became operational well in advance of the Verizon service restoration allowing mission-critical City government operations to get underway."[39]

While DoITT faced an enormous challenge in reconnecting the City's downtown operations, it faced an even more complicated situation in reconstructing the City's emergency response facilities. After being forced to relocate its operations twice after the collapse of its command center at 7 World Trade, OEM finally arrived at completely

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[37] "Officials Call for New Phones," Mark Binker, News and Record, March 16, 2002, p. B1; "Statement by Larissa Herda, President and CEO Time Warner Telecom," Federal Document Clearing House Congressional Testimony, March 6, 2002; "No Time to Grieve," Darby Patterson, Government Technology, February 2002; "Opening the VOIP Floodgates," Glenn Bischoff, Telephony, February 11, 2002

[38] "Hands Across IT Borders," Darby Patterson, Government Technology, January 2002

[39] "Transcript of the Minutes of the Select Committee on Technology in Government," City Council of the City of New York, May 6, 2002

empty space on Pier 92 and 94 on September 14. Larry Knafo, Managing Director of E-Government at DoITT, who had led contingency planning for the City's Y2K effort, stepped in to provide IT services to what became the Family Center for OEM – a 95,000 square-foot building on Pier 94 – as well as to OEM's command and control center on Pier 92. Computers had to be installed, connections brought in, networks built, and work stations created. "We started building on Friday morning [September 14] and were asked to have [the Family Center] open by Sunday morning at 8 am," Knafo explained. "You walked in and it's an empty pier with a concrete floor and there's absolutely nothing else.[40]" Working with technicians from DoITT, OEM, FEMA, Verizon, and numerous other private sector companies that volunteered installed more than 350 phone lines and 25 high-speed Internet connections by Thursday at Pier 92. Knafo and his team then ran cables from Pier 92 to Pier 94 and worked with Cisco to establish Internet telephones for the Family Assistance Center. By the Sunday following the attacks, Pier 94 was also operational, with 400 fully connected voice and data work stations and new software applications specifically designed for the emergency by companies including Filenet, Accenture, CTGI, Microsoft, and IBM. Ultimately, 500,000 lines of cables were laid at the two piers – 300,000 at the Family Assistance Center, and 200,000 at OEM's command center – while almost $10 million in software and hardware was donated by technology companies, large and small, that rushed to support the City's response to the attacks[41].

> **OEM Establishes New Networked Facilities Within Days of 9/11**

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Other Telecommunications Recovery Efforts

> **Reconnecting Federal Command & Control Operations**

Between the morning of Tuesday 9/11 and Wednesday afternoon, FEMA technicians worked to connect the FBI and the CIA at the FEMA staging area at Pier 90 to a truck that beamed telephone calls through a secure military satellite 12,000 miles above the Earth's surface. Managed from a FEMA center embedded in a mountain in Bluemont, Virginia that was intended for the President and Supreme Court justices in case of an emergency, the lines served as the most immediate, secure communications pathways for government operations after the disaster[42].

> **COWS: Cells on Wheels Ease Cell Phone Congestion**

Over the same time-period, network engineers at AT&T Wireless Services (AWS) initiated, coordinated, and implemented the addition of over 6,000 emergency voicemail hours in Queens, Manhattan, and Rochelle Park, New Jersey thereby increasing the number of voicemail messages allowed in subscribers' mailboxes.[43] In a practice mirrored by many other wireless carriers, AWS also ultimately activated 17 Cells on Wheels (COWS) able to process the increase in call volume experienced by AWS.

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[40] "Instant Net Speeds Disaster Response," Stan Gibson, eWeek, October 1, 2001, p. 64; "Phone Providers Near Ground Zero Are Still Frantically Scrambling to Catch Up," New York Times, Jayson Blair, October 8, 2001
[41] Ibid.
[42] "Agencies Unite Under IT Banner," InfoWorld, Dan Neel, September 24, 2001
[43] "Statement by Gloria Harris Vice President of AT&T Wireless Services before the United States Senate Subcommittee on Communications," Federal Document Clearinghouse Congressional Testimony, March 6, 2002

While cellular carriers quickly boosted their signals and governmental entities successfully moved staging locations outside of the frozen zones or used alternative carriers, Verizon was forced to immediately confront the damage to its West Street switching facility that had crippled much of its downtown network. Once Verizon workers were allowed into the building to assess the damage, officials realized that it would take months to come up with long-term solutions. In order to quickly address the situation, workers ran cables above ground on the streets to as many customers as possible and ran additional cables through windows at West Street to those portions of the facility that were physically operational. Verizon also gave cellular telephones, connected by portable antennas that were set up in parking lots in the hours after the attacks, to other businesses. In total, 18,000 emergency lines in and around the City were installed before the week was over. After two months, 4 million voice and data circuits had been rerouted or rebuilt, 3,000 technicians and managers had worked around the clock shifts, 18 new, completely fiber optic, high capacity backbone lines (known as SONET rings) had been laid, and Verizon had lost an estimated $2 billion in equipment and other losses[44].

In addition to the efforts of Verizon and AT&T, several other companies provided telecommunications assistance to the City. Among these,[45]

- Canon U.S.A. set up a laser that ran between satellite dishes to replace a data connection that was severed between two court buildings;

- Nortel Networks shipped 600 VoIP telephones to replace the more than 2,200 telephone lines down at the courthouses in Lower Manhattan. The effort went so far as to build a mini-telephone switching center in one building near the courts;

- Although Time-Warner Telecom (TWT) was not providing phone service to the City at the time of the attacks, it was able to install 300 phone lines for City Hall less than three days after 9/11 – a service that would have normally taken a minimum of 21 days to install because of the City's permitting process;[46]

- To aid in the various search and rescue efforts, the Wireless Emergency Response Team (WERT) – composed of major wireless providers – was convened shortly after the attacks. Most notably, WERT members allocated cellular channels for official use and provided roaming teams working in conjunction with search and rescue operations in order to pinpoint cellular devices in the rubble. Sadly, no survivors were found through this method.[47]

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[44] "A Nation Challenged: Communications," Jayson Blair, New York Times, October 8, 2001, p. 13; "No Time to Grieve," Darby Patterson, Government Technology, February 2002; "Technology Team on the Front Lines in New York City," Amy Spinetta, Government Technology, September 14, 2001
[45] "Telecommunications Companies Donate Resources to Recovery Effort in U.S." Global Telephony, November 2001
[46] "Statement by Larissa Herda, President and CEO Time Warner Telecom," Federal Document Clearing House Congressional Testimony, March 6, 2002
[47] See bullet in "Technology Lessons Learned" section that describes DoITT's recent testing of wireless location technology

Selected Agency Responses to 9/11's Technology Challenges

Law Department

As a result of the events of 9/11 the Law Department was immediately displaced from its headquarters at 100 Church Street and did not return until April 2002. Approximately 1,000 employees had to be temporarily relocated and the Department's files became inaccessible, affecting the daily operations and productivity of the Department. Moreover, because of the discovery of asbestos in mid-December, the Department's computers had to be thrown away. Fortunately, the Department had backed up all network data up to September 7 and was able to purchase new laptops and docking stations to operate the network by late November 2001. However, due in part to the lost work hours after 9/11 and judicial postponements, as of April 2002 the Department faced a backlog of 47,000 tort cases.[48]

> "As a result of those attacks, all 1,000 employees at 100 Church Street lost access to their offices, as you can imagine. This meant they had no access to their paper files, to their desktop PCs, their electronic files, such as their draft court papers, and to their Microsoft Outlook e-mail calendar and their contacts, essentially their electronic Rolodex, nor did they have access to the Law Department's system which tracks all our tens of thousands of cases. All but one of our other offices also lost Outlook, and with it their e-mail, their calendars, their contacts, and all Law Department employees lost access in their normal manner to Lexis, which as you know is our electronic research system for legal matters. The same day [9/11] the Department created a very primitive temporary website. It's sort of security by obscurity. It wasn't NYC.GOV. The site posted brief status reports, including that no Law Department employee had been killed or injured, at least as far as we knew then, and mercifully that was correct. On September 17, we began to retrieve the most critical files from back-up tape. Eventually we had CD-Roms built. If you have a network drive… you would have gotten it on a CD-Rom, so you could have used it at home.[49]"
>
> - Jack Hupper, Senior Counsel, Law Department

Health Department and Office of Chief Medical Examiner

Both the Department of Health (DOH) and the Office of the Chief Medical Examiner (OCME), engaged in an aggressive public information campaign in response to 9/11. To this end, and in a practice mirrored by many City agencies, both used the NYC.GOV website to provide updates regarding health and safety issues and available services, including an online Hospital Patient Locator system, missing persons information, DNA collection protocols, counseling information, anthrax information, and death certificate applications. In October 2001 alone, the Health Department received more than 66,600 hits to its home page on NYC.GOV by individuals seeking anthrax-related information.[50]

In order to supplement the online information effort and reduce the burden on their overtaxed telephone system, the Health Department also immediately activated its off-site emergency interactive voice response (IVR) and live operator contracts shortly after the morning of 9/11. Developed as a result of the Department's response to the West Nile virus outbreak in the fall of 1999, the IVR system enabled the Department to

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[48] "Trial Tech," National Law Journal, April 22, 2002, p. B10
[49] "Transcript of the Minutes of the Select Committee on Technology in Government," City Council of the City of New York, May 6, 2002
[50] Preliminary Fiscal 2002 Mayor's Management Report, February 28, 2002

rapidly adapt to the phone outages as well as reestablish communications with dislocated employees who used the system for gaining information on the Department's deployment strategy.[51]

OCME employed advanced DNA technology as the primary tool in the enormous operation to identify the remains of the estimated 2,840 victims of the 9/11 attacks. Together with several private sector companies, DOH, and HRA, this effort was quickly complimented by the development of successioning/tracking, document management, and data integration systems that seamlessly interfaced with the DNA collection efforts.[52]

Indeed, only days after 9/11 and despite the unavailability of many vital records systems, Health and OCME implemented an online death certificate issuance and tracking system for victims. This was, within weeks, supplemented by an electronic document storage and tracking system that maintained scanned documents of the all the affidavits and court orders produced and accumulated by victims' relatives. By February 2002, the system had enabled OCME to scan all of the case material for the more than 14,000 cases received and had enabled investigators to view entire case files without pulling the original paper file.[53] Finally, a browser-based integrated management system was developed that extracted data from 18 different database systems, cross indexed the information and then provided a single portal to view all the information, including scanned images. Through this system, DNA data could be compared to information gathered from medical or dental records, police files or property records.[54]

Given the scope of this four-pronged system, it is not surprising that the entire database now contains over 150,000 document images from the World Trade Center attack and over 100 gigabytes of data.

> NYPD Initially Built Simple MS Access Database for DNA ID Effort
> *******
> Microsoft Eventually Built SQL Server Supported System That Was Completely Web-Enabled

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"Our Vital Records Office, which receives, records, files, issues and amends birth and death records, was a critical service affected by the disaster. However, it relocated and had fully operational its Burial Desk and death certificate issuance system in six hours. Vital records reoccupied Department headquarters at Worth Street on September 17, having first broadcast-faxed notice to hospitals that we would be open to receive and process newborn certificates; and on that day completed and mailed all unfinished newborn certificates on site, recommended mail service via the main post office, since local postal service was suspended, and resumed key-entry of death certificates. Data retrieval was not restored until October 3. Internet ordering of birth certificates was restored within days and walk-in service on October 1st, as soon as connections to the mainframe service were reliable. By September 25, Vital Records, in collaboration with the Law Department and the Offices of the Chief Medical Examiner and of Court Administration, had in place methodology to issue a death certificate for victims of the attack. Amazingly, these accomplishments, nothing short of Herculean, were achieved amidst the loss of all on-site telephone, fax, computer, and Internet connections, with the entire automated Vital Records system and all 150 phone lines down, and only 12 operating replacement phone lines at the one-week point. Our Vital Records staff, in particular, deserves recognition.[55]"

- Edward Carubis, Assistant Commissioner, DOH

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[51] Preliminary Fiscal 2002 Mayor's Management Report, February 28, 2002
[52] Ibid.
[53] In the long term, OCME has signaled its intent to use this system to manage the file room and the archival of main autopsy files.
[54] "Transcript of the Minutes of the Select Committee on Technology in Government," City Council of the City of New York, May 6, 2002
[55] Ibid.

Administration for Children's Services (ACS)

      Immediately after the attacks, ACS did not have access to the State payment system through which foster care contract agencies receive payments. In order to continue to make payments and produce timely reports, ACS used the resources of the Financial Information Services Agency to issue all critical payments through the end of September 2001. This same problem affected ACS's ability to pay child-care contractors and receive their expense reports. In order to ensure that payments to child-care contractors were not interrupted, in September 2001 ACS made payments without adjustments for expense reports. Adjustments were made in the October and November 2001 payments[56].

The Board of Education

      The Board's Division of Instructional and Information Technology (DIIT) established temporary connectivity to work around the damage caused by the 9/11 attack. The damage caused long-term and sporadic telephone outage at the Board's offices, completely severed the schools and administrative offices from their Internet Service Provider (ISP), and caused service interruption for the Wide Area Network servicing over 1,200 schools. Accordingly, in mid-September 2001, DIIT began implementing alternate-routed ISP access to the Internet, primarily through the City University of New York (CUNY), to ensure more reliable connectivity. The alternate-routed ISP access was completed in February 2002.[57]

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[56] Preliminary Fiscal 2002 Mayor's Management Report, February 28, 2002
[57] "Lost Internet Causes Panic," Anemona Hartocollis, New York Times, October 10, 2001, p. D9

Technology Companies Respond to 9/11

Many City agencies worked with large and small private-sector technology companies to apply advanced technologies to all levels of the rescue, recovery, and demolition effort that followed 9/11.

Symbol Technology and Links Point

One mobile device pressed into service at ground zero was Symbol Technology's PPT 2800 handheld computer. Links Point of Norwalk, Connecticut supplied the units, with integrated barcode scanners, GPS receivers and custom software, initially so workers with the Fire Department (FDNY) could catalog items they extracted from the rubble during the recovery effort. Firefighters used the handheld computers to enter data on each item found, while the GPS logged the location, date, and time. Later, the worker inserted the device in a docking station to transmit the data over a wired connection to a central computer. The Federal Aviation Administration provided technology at the site to augment the location data received from GPS satellites.[58]

With assistance from IBM, the Department of Buildings (DOB) also successfully employed Links Point's handheld technology in their massive inspection effort of structures below 14 Street:

> "The challenge the DOB faced was that all the buildings below 14th Street needed to be inspected before the people who lived in them could officially reoccupy their homes. Again, in the extreme conditions following the attack, the existing paper process took too long. Often buildings needed to be inspected by more that one inspector, such as plumbing, electrical, and safety. Each inspector, however, didn't have the benefit of the previous inspection data because of the time-delay in processing paper reports. The answer to the problem was a wireless application that allowed the inspectors to fill out their reports directly into an electronic document and then immediately file the inspection when completed. Because of the wireless connection, previous inspections could be researched from the location being inspected. IBM, our partner on this project, has estimated that this solution, on average, reduced the time to process an inspection by more than 90 percent.[59]"
>
> – Strite H. Potter, President LinksPoint

Buildings Department Handheld Devices

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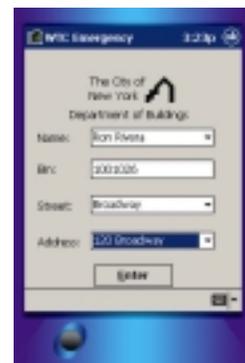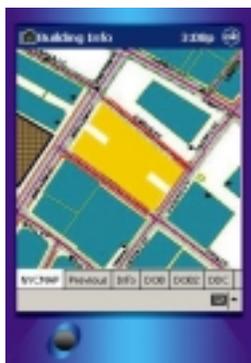
[58] "Mobile Imperative," Merrill Douglas, Government Technology, January 2002; "Breaking Ground," Laura Q. Hughes, Crain's New York Business, April 22, 2002, p. 17
[59] "Transcript of the Minutes of the Select Committee on Technology in Government," City Council of the City of New York, May 6, 2002

E Team – Crisis Management Software

In order to manage the expansive supply and donation effort after 9/11, OEM put crisis management software developed by a company called E Team into service. Ironically, OEM had decided to buy E Team software in August 2001 in order to better manage precisely the emergency situations that the City faced after 9/11. OEM intended to run the system on special server computers that were to be located in 7 World Trade Center. The planned installation date was September 17, 2001.

Using data that the City had sent to prepare for the planned launch, E Team engineers put together a system on E Team's own servers in California. By Wednesday, September 12, they had it ready to go. Pier 92 then became the staging site for monitoring supply orders and status reports, and using online maps to track the location of bulldozers and other equipment. Some managers at OEM even logged on from the disaster site itself using laptops with wireless Internet links.

Requests for supplies would be listed on the E Team website and could then be matched with vendors or donations – a 3,000-square-foot building needed by the Red Cross, for example, or the New York City Department of Sanitation's request for dump trucks and a supply depot near Ground Zero would be electronically entered and compiled on the website. Many of the supply orders then went to a football field-plus sized warehouse at Pier 36, on the Lower East Side of Manhattan. There, managers got the requests online and printed them out for warehouse workers. From there, most goods went to three smaller warehouses near Manhattan's southern tip, and to the Fresh Kills landfill on Staten Island. Once an order was delivered, an icon on E Team's website would turn yellow, indicating that the request had been met. Through this interface, OEM officials were able to efficiently manage multiple agency needs as well as the international donation effort that quickly developed.[60]

Overall, there were more than 1,700 individuals using the E Team system at the height of rescue and recovery efforts – none of whom had ever used the system before. They came from more than 200 entities, ranging from Motorola Inc. to the American Society for the Prevention of Cruelty to Animals; the NYPD to the State Emergency Management Office. By the end of operations, over 350,000 individual items were logged into the system and 4,000 requests had been entered, committed, and tracked[61].

Itronix

Several workers at Ground Zero carried rugged notebook computers with integrated wireless communications from Itronix of Spokane, Washington. The company donated 10 of its machines to the Federal Emergency Management Agency (FEMA) and another 10 to FDNY. FEMA's computers were additionally equipped with CoBRA (Chemical Biological Response Aide), a database and software package designed to help responders at the scene of a hazardous materials incident. Using data

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Remotely Hosted, Internet –Based Logistics Software is Pressed Into Service

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[60] "Breaking Ground," Laura Q. Hughes, Crain's New York Business, April 22, 2002, p. 17; "New York Relief Crews Get Assistance From E Team's Web-Based Software," Anna Wilde Mathews, Wall Street Journal, October 23, 2001

[61]"Transcript of the Minutes of the Select Committee on Technology in Government," City Council of the City of New York, May 6, 2002

from federal agencies and commercial sources, CoBRA provided fast access to instructions for responding to dangerous chemicals, biological hazards, and explosives. For example, if a truck carrying hazardous materials was involved in an incident near Ground Zero, or elsewhere, a responder could enter the number displayed on the truck's HAZMAT identification placard into the system and get an instantaneous report on response guidelines.[62]

PowerLOC – GPS

GPS Devices Installed on Trucks and Barges

To help prevent the loss of materials and evidence recovered from the WTC site, GPS tracking devices were installed on 225 dump trucks and five boats that transported debris from Ground Zero to the Fresh Kills landfill. Above all else, the system allowed for more efficient delivery of loads since dispatchers knew the precise location of a particular shipment at any time. According to Yoram Shalmon, President of PowerLOC, the number of loads per vehicle rose from four to ten per one-day shift, boosting efficiency by 150 percent[63].

Center for Robot Assisted Search and Rescue

After 9/11, sixteen small, camera-equipped robots, designed in part by the Center for Robot Assisted Search And Rescue (CRASR) and the Defense Advanced Research Projects Agency (DARPA), were immediately pressed into service by the President of CRASR, Col. John Blitch, to locate bodies in spaces that were too small or too hot for rescuers to safely explore. The robots eventually recovered at least seven victims' bodies and were later used to assess the structural integrity of buildings in the immediate vicinity of Ground Zero.[64]

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[62] "Mobile Imperative," Merrill Douglas, Government Technology, January 2002
[63] "Breaking Ground," Laura Q. Hughes, Crain's New York Business, April 22, 2002, p. 17; "Transcript of the Minutes of the Select Committee on Technology in Government," City Council of the City of New York, May 6, 2002
[64] Ibid.; "Agile in a Crisis, Robots Show Their Mettle," Jennifer 8. Lee, New York Times, September 27, 2001

The Importance of GIS

"I don't think anyone realized how critical a role GIS would play, including me... I'm not sure FEMA was aware of the criticality of GIS[65]"

- Alan Leidner, Assistant Commissioner, DoITT

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Nearly 10,000 Maps Were Plotted by the City's GIS Team after 9/11

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Almost immediately after the morning of 9/11, DoITT's Geographic Information System (GIS) Department assembled a team of municipal GIS technicians, private contractors, and expert volunteers to churn out critical mapping and data resources for nearly all aspects of the rescue and recovery effort. By December 2001, DoITT's GIS team, led by Deputy Commissioner Alan Leidner, had responded to more than 2,600 requests for mapping information from numerous City, State, and federal agencies. In a move which significantly streamlined the mapping process, the GIS team also developed more than fifty standard map products, updated on a regular basis, as well as eight clickable maps updated daily and posted on the City's website to inform New Yorkers about transportation options, utility outages, red zone access, and the status of buildings. As the demand for accurate maps of the area increased, one of DoITT's GIS contractors, ESRI, even built an online GIS request system, remotely hosted in Redlands, California, that allowed emergency responders and government officials to enter and track map requests through the City's web portal[66].

Contractor Builds Online GIS Request System: Remotely Hosted

As word spread of GIS's ability to integrate and quickly update multiple data sets in a series of visual overlays – including utility line locations, building floor plans, and topography – requests became more expansive, complicated, and, in some cases, vital. As Leidner explained, "We had to do a little education, but people were pretty quick learners. Pretty soon they were dreaming up data combinations that we couldn't imagine. I think it caught on, and it was understood that we were really an essential component.[67]"

How big was the debris field? What was the shape of the debris field? Where were the fires? What was the mass of the mounds?

One of the first tasks confronting the City's GIS team was the need for accurate aerial photographs of Ground Zero. Only three hours after the two jets crashed into the Twin Towers, a private GIS satellite called SPOT was over the East Coast to do just that. SPOT was able to capture 20-meter resolution infrared images of the fires blazing in Manhattan and provided these images to government agencies and the public for free over the Web. Given the FAA flight ban in the area, the SPOT imagery initially provided the only overhead views of the disaster area until the Fire Department's Phoenix Photography and Imagery Group, led by Captain Justin Werner, began taking photographs of the disaster area later in the afternoon, by "hanging out of a police helicopter.[68]"

After negotiating with the FAA, the State Office of Technology contracted with the GIS company EarthData for a series of overflights above Ground Zero in order to accumulate highly accurate images for use by the City's GIS team. The flights began in earnest on September 14 and, remarkably, by September 16 data was provided to the City's GIS team, as well as FEMA, for immediate use by planners and rescue workers alike.

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[65] "Alan Leidner, Director of Citywide GIS, NYC DoITT," GeoPlace.com
[66] "United in Purpose: Spatial Help in the Aftermath," Scottie Barnes, Geospatial Solutions, November 1, 2001; "Helping Hands," Dan Page, Government Technology, January 2002
[67] "Alan Leidner, Director of Citywide GIS, NYC DoITT," GeoPlace.com
[68] "GIS at Ground Zero," GeoPlace.com, Bruce Cahan and Matt Ball

> "The first data were received from the plane around 2 p.m. Saturday [September 13]. I think the EarthData folks finished processing it by 3 a.m. Sunday. From there, our staff got it to the State Police, who drove it down to the city.[69] EarthData flew again the next day, and the next, and the next, and so on. Needless to say, no one got much sleep for the first few days. Within a day or two, though, they were able to process the data in 10-12 hours after they were received. The thermal sensor was used early in the morning, and they were able to process that data within four to six hours after they were received. Eventually… LIDAR [images] were processed within six to eight hours.[70]"
>
> - Bruce Oswald, NYS GIS coordinator, Office for Technology

Aerial Photography Provides Critical Mapping Information for Rescue Effort

EarthData employed a combined suite of sensors that collected black-and-white digital imagery at 6-inch resolution, elevation data with a vertical accuracy of 6 inches, and thermal information that detected changes in surface temperature of less than 1 degree centigrade. The combined geospatial information collected by these sensors was converted into a range of computer maps and application products that recovery personnel used to calculate movement and cubic volume of all rubble piles, provide additional help in developing structural audits of all damaged buildings in the vicinity, and develop debris removal plans[71]. Together with the City and State, EarthData also arranged for the use of innovative ground-penetrating radar (called LIDAR) to provide in-depth information about the area immediately below the ground level of the World Trade Center site.[72]

Thermal Imagery Kept Workers Away From Dangerous Parts of the Site and Helped FDNY to Fight the Fire

By combining the aerial photography gathered by EarthData, SPOT, and the Phoenix Unit, with the locations of utility, water, and power outages, emergency responders were continually able to analyze their efforts to extinguish fires that blazed underground. In one particular instance, DoITT's GIS maps even helped firefighters change their tactics in this underground battle – showing how the use of injection foam was actually pushing fires out to new locations, rather than dousing the flames. Firefighters, recovery teams, and engineers also used the GIS maps to avoid potentially explosive underground fuel tanks and chemical storage facilities while digging for remains and removing debris. Finally, structural engineers used the maps to plot the building plans of the WTC area in order to provide a 3-D view of the underground levels – with before-and-after views of the site that helped determine existing conditions[73].

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[69] According to Bruce Oswald, because of bandwidth problems in New York City, OEM initially could not access the two Internet (File Transfer Protocol) sites that the State set up for remotely sharing photographic images. According to Oswald, "We were fortunate to get support from the State Police and the Metropolitan Transportation Authority Police. They had people standing by who would drive the data on CDs down to the city. Pretty soon they were hand-delivering CDs on a route that went first to the New York Fire Department, second to the Office of Emergency Management and third to the Federal Emergency Management Agency. We did that once or twice a day." "Bruce Oswald, Assistant Director, NYS Office for Technology," GeoPlace.com

[70] "Bruce Oswald, Assistant Director, NYS Office for Technology," GeoPlace.com

[71] "United in Purpose: Spatial Help in the Aftermath," Scottie Barnes, Geospatial Solutions, November 1, 2001

[72] "Helping Hands," Dan Page, Government Technology, January 2002

[73] "Mapping the Hazards to Keep Rescuers Safe," New York Times, Catherine Greenman, October 4, 2001

With subway tunnels destroyed, roads closed, and transit routes disrupted, DoITT's GIS team, in partnership with private GIS companies like Plangraphics, Intergraph Mapping, and GIS Solutions, also immediately set about helping the New York City Transit Authority (TA) integrate data from several City departments into a single map. The TA used this single map to make informed decisions about how to quickly restore and rebuild transportation routes in Manhattan.

Alan Leidner–Assistant Commissioner, DoITT (GIS)

"On September 11, while I was caught underground on a Number 1 train just north of Chambers Street, both World Trade Center towers came down. 75 Park Place at Greenwich Street, two blocks north of the World Trade Center, which housed the executive offices of DoITT, as well as the operation center for the Citywide GIS utility … was evacuated. Additionally, communications with 11 Metrotech, DoITT's operation center in Brooklyn, was cut off due to damaged telecommunications lines and switching centers. The main repository for the City's GIS data, the DoITT mainframe and Oracle database were located at Metrotech, so we were cut off from them…. [However] Hunter [College] had a complete copy of the City's basemap, very luckily, as well as other GIS data and dozens of workstations and several plotters. Thus began the GIS response to the 9/11 emergency."

"That night we printed several large images of the World Trade Center area and hundreds of smaller maps showing the street system and buildings, which we thought would be of use to EOC managers and to responders in the field. These were driven down to the Police Academy and immediately put to use. The next day, on Wednesday, September 12, we transported a microcomputer loaded with a copy of the City's GIS basemap data to the Police Academy and set up operations in a room on the sixth floor, one floor below the new EOC on the seventh floor. We were soon met by Paul Katzer of the Parks Department who had trucked over an entire GIS network, including six microcomputers, a server and a plotter…. At the same time we were calling in the troops. Jim McConnell, a City Planning employee, he worked for OEM, took over major management responsibility. Jack Eichenbaum, Chair of GISMO, a citywide organization of hundreds of GIS professionals in the metropolitan area, sent an e-mail out to his membership for volunteers. Wendy Dorf, GIS Director of DEP, Environmental Protection, and our infrastructure expert, also sent out calls to all GIS personnel in the City, in City government and to consultants we were working with."

"…We were instructed to develop information and maps about utility outages for internal analysis and posting to the web so we began working with DEP, Verizon, Con Ed and others. Mike Miller of City Planning became our web master and we utilized DoITT's new portal to project information over the Internet."

"On Thursday, September 13, it was announced that a more permanent EOC was being built on Pier 92 at West 52nd Street and the Hudson. Assessing our growing demand for maps and data, we asked for 25 work stations and six high-speed plotters, and enough space to house the staff necessary to use them. On Friday, through a miracle of the logistics pulled off by OEM, we moved into our new space with a fully functioning GIS infrastructure. We renamed ourselves the Emergency Mapping and Data Center, or EMDC, because it had become clear to us that we were developing data and integrating data and then representing that data graphically with maps - but that data previously developed and data generated by the emergency was the real 'stuff' we were working with. With a collection of City GIS technicians, consultants, and volunteers from all over the City, including some from Westchester, we were able to staff the EMDC 24 by 7 for more than two months."

Technology Lessons Learned

"The task ahead of us now is to strategically develop an approach [to] how we can leverage this investment we have made into a more strategic solution,[74]"

- Avi Duvdevani, Former Acting Commissioner DoITT

In responding to the widespread telecommunications outages and the expansive rescue and recovery effort that followed the 9/11 attack, New York City, led by DoITT and OEM, developed, implemented, and procured innovative technology solutions for events that the City had only partially prepared for through Y2K planning. With its comprehensive Hazard Mitigation proposal in hand, as well as numerous post-response conferences and meetings completed, the City has now positioned itself to take full advantage of the technology lessons that were learned during and after the attack.

Of course, given New York City's looming budget deficits as well as the costs associated with infrastructure and technology upgrades, actually implementing these initiatives will be extremely difficult and expensive. As Avi Duvdevani explained, "the ultimate implementation of such diversified network solutions [among other technology initiatives] would require a rather costly build-out, which will be subject to funding substantial capital and recurring expense allocations.[75]"

Despite the clear need, the large expense, and the City's ongoing funding difficulties, FEMA has unfortunately maintained its decision to reduce the contribution level for the Hazard Mitigation program in New York from 15 percent to 5 percent of their total commitment to the disaster and has set the ITT guidelines in such a way that many vital technology initiatives are simply ineligible for funding. <u>Notwithstanding this situation, DoITT has made significant strides in marshalling resources and support for implementing several of the technology lessons that were learned after 9/11.</u> To this end:

- In November 2001, DoITT completed the development of contingency operation plans for the NYC.GOV portal environment. This solution provides the capability for continuing to operate the portal in the event of a major disaster or outage affecting the primary hosting provider.[76]

- DoITT has developed a "draft" plan for agencies to "prioritize and deploy replicable, consistent, diverse infrastructure solutions." This is the beginning of a process to update the City's Y2K plan in such a way that all agencies have fall-back telecommunications and IT systems. As a part of this, DoITT is currently in the process of developing a "Hot" and "Cold" site strategy for each agency that takes advantage of the City's own capacity for providing redundant systems and operating space. DoITT has also addressed the importance of maintaining redundant network support for its own facilities by identifying Sungard Recovery LP as the winning bidder to the agency's August 2001 RFP for Hot Site and Cold Site construction. The RFP is currently in public review.[77]

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[74] "Hands Across IT Borders," Darby Patterson, <u>Government Technology</u>, January 2002
[75] "Transcript of the Minutes of the Select Committee on Technology in Government," City Council of the City of New York, May 6, 2002
[76] <u>Preliminary Fiscal 2002 Mayor's Management Report</u>, February 28, 2002
[77] Disaster Recovery Services Contract between the City of New York and Sungard Recovery LP, Submitted by DoITT

- In the aftermath of 9/11 and the anthrax attacks, the Health Department used officers from the federal Epidemic Intelligence Service stationed in 15 "sentinel" hospitals citywide, 24 hours a day to collect data, that was then analyzed centrally at the Department's relocated central headquarters. Since the end of 2001, the Department has made the system electronic and expanded it to 35 hospitals covering two-thirds of all emergency department visits. This system provides a critical complement to the Department's PRIME system, which will eventually automate the collection, tracking and analysis of all health events in New York City. Unfortunately, according to the Preliminary Fiscal Year 2002 Mayors Management Report (PFY2002 MMR), "The continued development of this system has been deferred pending the Department's assessment of the effect of the National Electronic Disease Surveillance System (NEDSS).[78]"

- In August 2001 DoITT successfully launched the Emergency Management Online Locator System (EMOLS) on NYC.GOV. This system was developed to assist the public during coastal storms and in heat waves. The application allows the public to determine if they are in a hurricane zone, identify hurricane shelters, and locate routes to those shelters by private and public transportation. In addition, the application can be used to locate cooling/AC centers. During the period following the 9/11 attack, the application was modified to provide citizen, business, and vehicle access information, as well as the status of infrastructure in the area affected by the disaster. People could go to the site and enter the address of any building below Canal Street and find out what zone that building was in and whether they could travel to it and work in it.

- According to the PFY2002 MMR, DoITT is currently in the process of enhancing the City's telecommunications outage/disaster preparedness by revising and updating the language of the City's MARC agreement.

- Although DoITT had started to assign building "footprints" to all 1 million NYC buildings before 9/11, the process was barely underway. As such, the City's GIS team could not properly map and cross-index certain features in the impacted area south of Canal Street. DoITT was therefore forced to commit significant resources early on to the arduous process of assigning these "footprints" – essentially individual, geographic identifiers – to all of the area's buildings. Since the disaster, DoITT has prioritized the "footprint" project and expects completion by June 2003[79].

- Shortly after 9/11, representatives from the Department of Environmental Protection and DoITT's GIS division created the Deep Infrastructure Group to systematically address the need for mapping a wide array of infrastructure categories – including the locations of water mains, sewers, power lines, and telephone lines. Most significantly, the Deep Infrastructure Group is in the process exploring the availability of building floor plans and locating features that may be vulnerable to an attack. A preliminary meeting was held on

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[78] The federal Centers for Disease Control is leading the creation of NEDSS, which is comprised of an Internet-based infrastructure and set of standards, to create an electronically linked and integrated national disease surveillance system. The Department's assessment is expected to be completed by a revised date of Summer 2002. Preliminary Fiscal 2002 Mayor's Management Report, February 28, 2002
[79] Ibid.

November 14 with representatives of the Department of Buildings (DOB), to ascertain if they possessed the required data. At the conclusion of what was described as "a productive meeting," DOB committed to share its data, most of which is required for this effort. Since then, a pilot program has been initiated to integrate DOB's data sets into an integrated GIS database jointly coordinated by DoITT and OEM. The primary function of the pilot is "to build a data collection workflow and an institutional framework for monitoring availability, completeness and accessibility of information in emergencies.[80]"

- Shortly after a GIS team from Minnesota began assisting the City's mapping effort with a so-called "Map Mobile," DoITT realized the value of having mapping and data collection capabilities at emergency sites and outfitted a Department van with a complete GIS system. The City's own "Map Mobile" was immediately put to use after the Belle Harbor airplane crash and now serves as an important element in the City's overall disaster response strategy.

- DoITT has also begun a trial test of GeoMode Incorporated's wireless location positioning technology to help emergency officials pinpoint the location of wireless cell phones and Personal Digital Assistants. Similar technology was put to use after 9/11 but had not been previously available to NYC's emergency workers.[81]

While DoITT and several other City agencies have made substantial progress in changing the way that City's IT and telecommunications systems operate during and after disasters, more can and should be done. Specifically,

- <u>VoIP, wireless networks, text-messaging systems such as Blackberries,[82] and the Internet in general offered cost-effective, relatively stable platforms for information dissemination, multi-directional communication, and command and control after 9/11</u> – to the point where the Mayor's Office has kept its VoIP network instead of returning to Verizon's telephone network. Indeed, these systems should not only serve a more integral role in emergency response planning, but they should also be incorporated into ongoing agency practice. In the case of VoIP, the city of Houston has already begun deploying the technology and expects to eventually convert all 25,000 municipal phones to VoIP. In long distance phone calls alone, Houston expects to save $6.7 million annually, without even considering the cost savings of the applications that will be able to run on the network. In one example of this, Houston will be able to go from 43 voice-mail systems to one with VoIP, which will lead to additional savings for the city.[83]

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[80] <u>Preliminary Fiscal 2002 Mayor's Management Report</u>, February 28, 2002; "Deep Infrastructure Group Provides Critical Data for Disaster Relief," <u>GeoPlace.com,</u> K. Adams Manion, Wendy Dorf, and Marina Havan-Orumieh

[81] "New York Selects GeoMode for Trial," <u>PR Newswire</u>, February 2002

[82] Shortly after 9/11, IBM created a Blackberry enabled, wireless text-messaging network for DoITT, the Governor, and some non-profits, such as the Red Cross, that allowed for full access to e-mail.

[83] "Houston Lifts Off," <u>Government Technology</u>, May 2002; "Opening the VOIP Floodgates," Glenn Bischoff, <u>Telephony</u>, February 11, 2002

- The City should procure redundant and geographically diverse telecommunications networks as it looks towards an overhaul of its municipal voice and data systems. Indeed, as NYU's Downtown Hospital unfortunately discovered, simply contracting with two phone or data companies does not necessarily ensure network redundancy since several companies often rely on one sight or one underground conduit – as was the case with NYU's backup provider MCI who co-located with Verizon at West Street.[84] Although the City had not adequately prepared for the magnitude of service disruption that followed the partial destruction of Verizon's West Street station, NYU's experience highlights the added, sometimes unforeseen, difficulty of procuring truly redundant telecommunications service. The City should therefore look towards engaging multiple telecommunications carriers that operate on geographically diverse networks.

- New York City, in partnership with the State and federal governments, must diversify the Fiber Optic trunk lines that link the City, and much of the nation, with Europe and the Middle East. According to Senator Charles Schumer's Office, "… all of the fiber optic wires connecting the US to Europe and the Middle East – known as Submarine Fiber Optic Communications Systems – funnel into just two locations in lower Manhattan."[85] Should either of these lines be even partially disabled, the practical effect of most diversity efforts would be severely diminished.

- City agencies must continually update their Continuity of Business Plans to adapt to changing conditions. Such plans must also be made available in hard copy – at central locations – as well as in a secure electronic format in case of physical displacement.

- Agencies should back up data remotely, when possible, since backup data tapes may not be available after a disaster.

- The human effects of catastrophes directly affect IT disaster response. According to Avi Duvdevani, the usefulness of ranking mission-critical agencies in Y2K planning was disrupted by the fact that certain agencies identified as high priority sites had personnel too traumatized by the disaster to operate as called for under the emergency action plan.[86] Future emergency response plans should account for human trauma and include flexible execution strategies.

- As Jack Hupper of the Law Department testified, City agencies should collect home email addresses for use in emergencies and should have standby contracts with Application Service Providers (ASP) so critical agency operations and communications can be conducted by employees at their homes or at alternative sites[87].

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[84] "Carriers Stay Course with NYC Networks," Michael Martin and Denise Pappalardo, Network World, March 11, 2002, p. 1

[85] "Schumer: NY Dangerously Unprepared for Cyber Terrorist Attack," Office of United States Senator Charles E. Schumer, February 17, 2002

[86] "No Time to Grieve," Darby Patterson, Government Technology, February 2002

[87] "Transcript of the Minutes of the Select Committee on Technology in Government," City Council of the City of New York, May 6, 2002

- Aerial photography of Ground Zero played a vital role in rescue and recovery efforts. As Alan Leidner explained, two problems quickly emerged after the disaster: "first, realizing that we needed aerial photography quickly, and second, trying to get the clearances. They were ready to shoot anything down." In order to address these issues, the State Emergency Management Office should establish a standby aerial photography contract as well as develop a process for emergency overflight clearance with the FAA[88].

- The City should establish a permanent home for GIS operations in the Office of Emergency Management and should develop standards for collecting, producing, and disseminating GIS data. As Alan Leidner explained, "In the future we really need to have a centralized mapping operation where FEMA comes, where Department of Defense comes, where the State Office of Technology comes. It all needs to be in one place, and that place is established and designed ahead of time. We need to have templates for data collection. We need to have templates for maps. We need to have the way we want to post to the Web. We need to have relationships with the news media. A lot of stuff in retrospect might have been prepared ahead of time."[89]

- The City should develop plans for reviewing NYC.GOV's content and applications in the event of alternative emergency scenarios. Perhaps most importantly, the City should develop a Web-based emergency portal for information dissemination, emergency applications, and agency communication and operation. Such a portal could immediately serve in place of the existing NYC.GOV portal, for example, with sensitive content immediately removed from the sight according to the active threat scenario. Such a site would also preclude the practice that many agencies, like the Law Department, employed after 9/11 whereby temporary agency websites were created for information dissemination – often without adequate security arrangements.[90] Elaborating on this concept, in a July 2002 report, the National Association of State CIO's recommended that states design their own emergency portal that would:[91]

  o Integrate emerging technologies for emergency response such as intelligent roads and radio-frequency infrastructure;
  o Include a public access site as well as a private enterprise site for coordinating emergency response [and, one should add, a site that directs volunteers and establishes general response protocols for the public];
  o Develop an Internet based, unified permitting system to provide access to restricted zones;
  o Build a secure front-end for the use of handheld devices [and intake applications];
  o And, post contact information for agencies.

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[88] "Al Leidner, Director of Citywide GIS, NYC DoITT," GeoPlace.com
[89] Ibid.
[90] "Transcript of the Minutes of the Select Committee on Technology in Government," City Council of the City of New York, May 6, 2002
[91] "Public Sector IT Security," NASCIO, July 2002

- New York City should also preserve the Filenet system that was put to use in the massive identification effort following 9/11. The system now contains over 150,000 document images from family members and others and over 100 gigabytes of WTC data that will undoubtedly serve as a valuable repository for historical analysis.[92]

- New York City should develop a local Emergency Technology Corps, modeled on the "National Emergency Technology Guard" currently under consideration by Congress. Although groups like SiliconAlleyCares and GISMO deployed hundreds of IT professionals locally after 9/11, the City should take the lead in funding a database of local IT professionals, creating emergency response plans, and organizing a program of periodic training sessions.

Fire Department Communications Problems

One of the most critical technology failures, and arguably the one that caused the most physical and emotional damage, was the inability of Fire commanders on the ground to communicate via radio to firefighters in the WTC buildings before their collapse. Indeed, in March 2001, the Fire Department recalled 2,700 new, all digital Motorola radios after receiving complaints from the Firefighters Union that the radios failed to work effectively in high rises. Older Motorola radios were then put back into place (see City Council Committee on Fire and Criminal Justice Services Oversight Hearing on April 10, 2001[93]). These radios were supposed to operate effectively in WTC buildings since the Department had installed a booster system nearby after the 1993 terrorist bombing. But the system failed after the 3-foot antenna was taken out by falling debris shortly after the attacks. As such, radio transmissions were spotty, and an order to evacuate the towers before they collapsed was not received by many firefighters.[94]

According to the PFY2002 MMR, shortly after 9/11, DoITT engaged a consultant to develop engineering specifications and a design for a citywide Channel 16 public safety radio infrastructure that will enable "all of the City's public safety functions [to] communicate using the same infrastructure and [with] the highest levels of interoperability." DoITT expects to issue an RFP for this radio network in Fiscal 2003, with project work expected to take one year.

In light of the FDNY's communications problems after 9/11 as well as their prior problems with digital radios, DoITT has also begun to review the feasibility of moving all City agencies to a digital radio format. According to DoITT, "an analysis of City agencies'… radio systems needs to be made to determine the feasibility of consolidation before the upgrade can begin. A staff shortage has delayed this project and completion is subject to the Department's ability to secure the technical expertise necessary.[95]"

[92] "Transcript of the Minutes of the Select Committee on Technology in Government," City Council of the City of New York, May 6, 2002

[93] Briefing Paper of the City Council Committee on Fire and Criminal Justice Services, Council Member Lawrence A. Warden, Chair, April 10, 2001

[94] "Tower Disaster Echoes Lessons of Earlier Fires," Eric Lipton and James Glanz, New York Times, April 2, 2002, p. 1; "9/11 Exposed Deadly Flaws in Rescue Plan," New York Times, July 7, 2002, Section A p.1

[95] Preliminary Fiscal 2002 Mayor's Management Report, February 28, 2002

Despite the ongoing difficulties associated with upgrading the City's radio network, DoITT is clearly committed to moving forward with a more interoperable and durable communications network. Tragically, the FDNY's communications problems before 9/11 and during the 9/11 response highlighted both the necessity for aggressiveness in this regard as well the need to reassess the old framework for understanding the City's rapidly shifting communications responsibilities.

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The City's response to the 9/11 attacks highlighted the crucial role that IT and telecommunications systems play before, during, and after emergencies. Indeed, the City was faced with enormous technology challenges that it countered with, and, in some cases, could only counter with innovative technology solutions.

It "goes without saying" that the role of technology – the vulnerability that it brings along with it as well as the promise – will only increase in the future. As such, the City finds itself at a crucial point in time where narrow technology initiatives, focused solely on emergency response, for example, will surely fall short. In many ways then, the City's technology response to 9/11 – through GIS, NYC.GOV, handhelds, databases, electronic bio-terror surveillance systems – provides a strong case for quickly moving City Government to a significantly broadened e-government platform that, as an important consequence, is capable of effectively responding to emergency scenarios – as well as to the more routine needs of day-to-day municipal government.

As Jack Eichenbaum, Chair of GISMO and Assessor at NYC's Department of Finance, explained in reference to some of the frustrations that the City's GIS team encountered in their efforts to integrate municipal data sets (some of which were only available on paper), "The more we wrestled with data problems, the more we agreed that data was more fundamental than mapping."[96] Indeed, for the City's GIS team, the Deep Infrastructure Group, the Buildings Department, City Planning and so on to all City agencies, emergency responders demonstrated a clear and vital need for data that was electronic, communicable, and decipherable through common standards. Where this electronic government was disabled or "offline," response suffered, costs and externalities increased, and suffering was exacerbated.

The trajectory of the Family Assistance Center provides perhaps the most compelling illustration of e-government's significance in emergency situations as well as, potentially, in the normal course of municipal practice. According to Brent Woodworth, Manager of IBM's Crisis Response Team, "what appeared to be a challenge was that as families would come in, they would write out or fill in forms for each particular agency, and these forms were fairly thick. And as soon as they finished filling out this form – filling it in which was a traumatic or stressful event – they would go to the next agency and fill out almost identical series of forms. This, in our opinion, was unacceptable." Accordingly, and in a classic e-government response, IBM automated the intake systems so victim's families would only enter data one time – "and

9/11 Demonstrated the Effectiveness of E-Government: As Well As the Need For Fully Realizing It

"There Will Be No Slow Down in Our E-Government Initiative. In Fact, It's Accelerated."
-Avi Duvdevani

"We'd try to integrate some of the data, and it was impossible. So we pulled together the agency groups and told them we had to standardize the way we're doing this and create a unified database."
– A. Leidner

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[96] "CAMA, GIS, and the Recovery of NYC," Jack Eichenbaum, April, 2002

then as they would move to the next agency, that data could be brought up, yet kept secure, so that it would reduce some of the trauma and stress of re-entering the data."[97]

IT solutions such as this proved extremely valuable after 9/11 – as did the volunteers, contractors, and City personnel who designed and operated the systems, oftentimes under severe physical and emotional duress. It is now up to the City to aggressively move forward with a comprehensive strategy for fully implementing e-government – not just for emergencies like 9/11, but for all aspects of City Government.

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[97] "Transcript of the Minutes of the Select Committee on Technology in Government," City Council of the City of New York, May 6, 2002