

Town of Greenwich 2007 Strategic Technology Plan



September 2007

BlumShapiro
CONSULTING

I. Executive Summary

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A. High Level Overview

As a continuation of a prior Technology Plan (adopted in November 2002), the Town of Greenwich initiated a new phase of the Technology Plan to help develop a technology foundation that would allow Town employees and residents share and access key information, as well as improve services to the residents of the community. Unfortunately, for many Towns the dollar resources to support such endeavors are in direct competition with shrinking and/or stagnant budgets.

As such, this plan recognizes a multi-year approach and provides a comprehensive “road-map” to the resources and technology required. The Technology Plan was developed in conjunction with Blum Shapiro Consulting, LLC to help identify the technology direction that the Town of Greenwich should consider over the next three years.

As part of this evaluation, over 45 focus group sessions were conducted to identify the needs and requirements of the Town. Individual interviews were subsequently held with most departments to confirm requirements and view the technology in place first hand. Included in this effort were discussions with the Greenwich Board of Education and Libraries to review current strategies and initiatives to ensure consistency with the selected direction. As part of this overall process, a review was performed to:

- Determine the effectiveness of existing systems
- Review the current technologies and technical direction of the Town
- Assess the progress of technology initiatives underway
- Develop recommendations for the Strategic Technology Plan.

Several common issues were identified as an outcome of the interviews, focus group sessions and general review of operations. In developing the overall plan, we analyzed user needs, current hardware and software inventories, manually intensive processes as well as technology projects currently in progress. Technology alternatives were investigated and considered in order to determine the best solutions possible.

In order to chart a course for the use of technology for the Town of Greenwich, a strategic vision was created to determine how technology could be used to enhance the services and programs provided by the Town more effectively.

The objective for this vision was to define a direction for technology and identify the initiatives and projects necessary to make this vision a reality. By considering various internal and external demands placed on the Town, such as customer service requirements, budgetary constraints and operational needs, we were able to identify the following strategies:

Strategy 1 – Build and Support the Town-Wide Infrastructure

As the custodian of the Town’s technology, the IT Department supports a mission critical need by providing the infrastructure (a combination of telecommunications, hardware and software) that allows appropriate access to information. The IT Department must deliver quality services to departments/divisions and the public with a focus on providing convenience, reducing data redundancy, and improving security.

Strategy 2 – Enhance Information Security and Compliance

As the Town continues to expand access to data and information resources, the need to maintain a secure, controlled environment becomes increasingly more critical to ensure the integrity of the information maintained on Town systems. This requires that appropriate policies, procedures and practices be implemented and understood by all Town employees and users of Town information management resources.

Strategy 3 – Reshape and Enhance Processes Through Information Technology

As the Town continues to move forward with enterprise-wide technologies, it will be imperative that Departments demonstrate how new systems will improve Town operations, enhance customer service, reduce overall costs and streamline current processes. It will be critical that the goals and objectives of new technologies be identified, with appropriate cost/benefit analyses developed to identify the anticipated tangible and intangible benefits that can be expected.

Strategy 4 – Promote Knowledge and Understanding of Town-Wide Technologies

The successful use of any technology tool relies heavily on the ability of users to effectively apply those tools to the processes they manage. By providing a formalized, on-going training program and instruction on all mission critical applications, the Town helps users develop the skill sets necessary to use key systems.

Strategy 5 – Expand Governmental Services Through Information Technology

One of the most effective solutions for addressing the growing demands of customer service within Town government is to expand and promote the use of the Internet as a key business and communications tool. This approach allows residents to perform many of the services offered by the Town through web-enabled and interactive applications.

B. Completed Technology Plan Initiatives

Over the past several years and based on the original adoption of the November, 2002 Strategic Technology Plan, the Town of Greenwich and especially the Town's IT Department has made great strides to help implement various technology initiatives. Outlined below are the key technology initiatives for the last several years.

Infrastructure Initiatives

1. New demands for better performance, new applications (Greenwich School District Voice over IP (VoIP)) and enhanced quality of service forced the IT Department to evaluate and consider other MAN infrastructure alternatives. As a result, the Town's IT Department identified and implemented a fiber Gigabit Ethernet network and has recently completed and implemented the MAN upgrade through Cablevision.
2. Since not all remote locations were accessible through the Cablevision network, the IT Department identified and implemented a wireless technology solution to connect one of the Town's marinas to the rest of the network. The Greenwich Point marina now has a WiMAX 10 Mb connection to the Town Hall and can access key applications and information on the network.
3. The IT Department implemented virtual server technology using VMware. Server virtualization allowed different applications and even different operating systems to run simultaneously on the same enterprise-level server. Each virtual server acts just like an individual, stand-alone server, but actually runs under the umbrella of one virtualized server. Running multiple applications on a single server increases server efficiency and reduces the number of servers to be managed and maintained by the Town.
4. Storage Area Network (SAN) technology was implemented within the Town's IT operations. A SAN is a device that contains nothing but disks for data storage. The benefits of a SAN include an increase in the performance and availability of town-wide data storage.

Software/Operational Initiatives

5. The MUNIS ERP software solution was further enhanced by adding additional software modules available to users. This allowed for data to be better integrated from one module to other modules. Integration also allows "drill-down" capabilities, from summary to details and across related information from other modules. This integration helps to eliminate duplication of data, duplication of effort (enter data once and integrate same data with other modules) and ultimately enhances the Town's overall internal processes.
6. After a comprehensive software selection process, the Town selected an enterprise wide permit tracking system, CityView by Municipal Software. The Permit software streamlined the process of issuing and tracking permits and automated the entire process from initial application to the issuance of the Certificate of Occupancy. Property and permit information was instantly available, from owner and contractor information to sub permits, utility releases

to expiration dates. With the Permit software, departments (e.g. Building) were able to manage inspection scheduling and workflow, including the ability to create a daily inspection rosters.

7. Due technology concerns and long-term company stability issues, the Town implemented a new collaboration software solution, IBM Lotus Notes. This solution provided an integrated email, calendaring and collaboration capabilities.

C. Recommended Technology Plan Initiatives

In developing the aforementioned strategies, it was necessary to analyze the various functional issues confronting the Town of Greenwich from an operational, customer service and technology perspective. Outlined below are the Technology Plan's recommendations broken out by strategy.

Strategy 1 – Build and Support the Town-Wide Infrastructure

- *Implement a Business Continuity Plan and Integrate It With the Town's Emergency Preparedness Program.*
- *Design and Implement a Town-Wide Wireless Communications Strategy.*

Strategy 2 – Enhance Information Security and Compliance

- *Perform a Data Security Assessment.*
- *Develop Technology and Operational Policies and Procedures.*
- *Develop an eDiscovery Plan.*

Strategy 3 – Reshape and Enhance Processes Through Information Technology

- *Create An Integrated Permit Tracking Process.*
- *Purchase and Implement Mobile Permit Tracking Capabilities.*
- *Create An Integrated Document Management Storage Process(es).*
- *Develop Document Storage and Management Standards.*
- *Confirm Capabilities of the MUNIS Tax Software Module(s).*
- *Evaluate and Consider Purchasing /Implementing Additional MUNIS Module(s).*
- *Document and Communicate a GIS Plan.*
- *Perform a GIS Based Aerial Fly-Over.*
- *Implement User Groups For Each Enterprise Application to Provide and Promote Consistent Oversight.*
- *Enhance and Better Utilize the Town's Intranet.*
- *Develop an Implementation Schedule Identifying Critical Tasks and Completion Dates For All Technology Initiatives.*

Strategy 4 – Promote Knowledge and Understanding of Town-Wide Technologies

- *Coordinate and Communicate Training Programs With Human Resources.*
- *Provide Training Sessions on Key Applications.*
- *Ensure IT Staff Attend Regular Technical Training Classes.*

Strategy 5 – Expand Governmental Services Through Information Technology

- *Develop a Strategic Web Site Plan.*
- *Create a Web Site Oversight Committee.*

Benefits To Be Achieved

Some of the benefits that can be expected from our recommendations are as follows:

- Enhance communications within and between departments, other Greenwich operations, other organizations (i.e., towns, states, federal government) and residents.
- Enhance data management of information (i.e., backup, security, disaster recovery).
- Enhance the ability to maintain and manage consistent Town standards.
- Minimize duplication of financial documents (i.e., budgets and reports) independently from MUNIS.
- Enhance timeliness and accuracy of information.
- Enhance the ability to electronically share documents and schedules and organize functions through a central medium.
- Minimize duplication of effort by eliminating redundant data sources.
- Improve training, support and maintenance of applications.
- Improve Community-wide planning capabilities.
- Increase ability to implement future standards and applications.
- Provide an infrastructure to allow residents and employees access to Town information.
- Enhance communications with residents by providing “24-hour” information services.
- Allow access to key information (i.e., permits, tax collector/assessor) from home or business.

We have identified a three year approach (including projects to be completed by the end of this fiscal year-Year Zero) to implement the designated recommendations. Key implementation items for each year are outlined as follows:

1. Year Zero (Fiscal Year 2007 - 2008)

- Finalize the implementation of the new enterprise wide Permit Tracking software solution.
- Complete the selection of a new Digital Imaging and Archiving solution.
- Hire an outside firm to update the Town's GIS information.
- Enhance the utilization of the MUNIS Tax system, additional training will be purchased and provided by the vendor.
- Ongoing technical training will be provided to the IT personnel.
- The Town will work with MUNIS to identify the requirements and open issues of the Tax Assessor/Collector offices. The intent of this project is to recommend functional changes to the MUNIS Assessor/Tax modules.

2. Year One (Fiscal Year 2008 - 2009)

- New mobile computers are implemented to allow Building Inspectors and others to utilize the Permit software in the field.
- The Town develops a Wireless Communications Strategy.
- The Town initiates an independent consultant to perform an internal and external security assessment.
- The Town initiates the development of an eDiscovery plan.
- Additional training programs will be introduced to Town employees, which will provide Windows, MS-Office and MUNIS software training to users.
- Ongoing technical training will be provided to the IT personnel.
- The Department of Public Works obtains additional training on the PavementView software.
- The Fire Department receives additional training on their Fire Management software solution.
- The Law Department obtains additional training on their current software solution, "Time Matters".
- Based on the Web-Site Strategy, the Town continues to enhance its web site.

3. Year Two (Fiscal Year 2009 - 2010)

- After the Town creates a communication strategy the Town implements the respective hardware/software to provide for wireless capabilities throughout the Town.
- The Town's Intranet capabilities are enhanced, providing a broader range of internal services to Town personnel.

- The Town of Greenwich continues to enhance their current Website.
 - New MUNIS software modules are implemented (i.e., Bid Management, Work Order, Pension) and integrated into the current enterprise-wide solution.
 - On-going MUNIS training is provided to users on the various aspects of the MUNIS modules.
 - Following the GIS plan, the GIS Coordinator and GIS User Group continue to enhance the GIS system and add new layers.
 - Additional GIS training is provided to other key users of the GIS system.
 - New software is purchased for the Department of Public Works (i.e., Drainage and Civil Storm).
 - Additional mobile computers are implemented to take advantage of utilizing the permit tracking software in the field.
 - A reverse E-911 software solution is purchased to help enhance the emergency preparedness of the Town.
 - New MUNIS reporting capabilities are introduced. This allows users to have better access to information within the MUNIS software modules.
 - A software selection project is performed to evaluate the Health Department's Case Management needs and requirements.
 - A software selection project is performed to evaluate the Health Department's Laboratory Information Management needs and requirements.
 - Ongoing technical training will be provided to the IT personnel.
 - In order to enhance efficiency, the Law Department "pilots" using voice recognition software to help with the development of legal documents.
 - Utilizing the Town's GIS, the Police Department implements the HTE Public Safety system interface for the ESRI GIS system.
- 4. Year Three (Fiscal Year 2010 - 2011)**
- On-going MS-Office and MUNIS training is provided to users.
 - The Town continues to expand field operations and leases additional mobile computers.
 - The Fire Department introduces Mobile Data Terminals (MDT's) technologies within their fire vehicles.
 - New Case Management and Laboratory Management software solutions are introduced within the Health Department.
 - Additional software capabilities are added to the MDI system. Clinical and Scheduling modules are implemented within Nathaniel Wetherell.

- The Town hires an independent consultant to evaluate and perform a Disaster Recovery/Business Continuity Plan.
- Ongoing technical training will be provided to the IT personnel.

The costs for implementation by Year are outlined below:

<u>Costs</u>	<u>Year 0</u>	<u>Year 1</u>	<u>Year 2</u>	<u>Year 3</u>
Total	\$3,690,800	\$3,341,00	\$3,881,963	\$3,558,783

These figures represent the total costs for all technology initiatives outlined in the Technology Plan. Some funding is currently set aside in a variety of budgets to cover some of these projects. As such, the above figures do not necessarily represent all new costs to the Town.

II. Introduction

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Technology is rapidly evolving and changing, month-by-month, year-by-year. All too often, technology choices (both hardware and software) are predicated on the needs of a particular department or small group instead of identifying the requirements of an entire organization. This has contributed to organizations inadvertently spending a great deal of money developing isolated “islands of information” that limit the access and use of information between and within departments and organizations. In addition, incompatibilities between hardware and software products have forced many organizations to “ripout” and replace technology before its useful life has expired.

Although it is difficult to predict the future, it is possible to implement a technology foundation that an organization can build and grow on. This foundation needs to be well thought out and planned in order to encompass the needs and requirements of the entire organization. A technology plan can help to identify hardware, software and networking standards, as well as establish a direction for future growth. As such, this document has been developed to help guide the selection and implementation of new technologies over the next three years.

The issues and concepts presented in this plan address all Town offices/departments. Although the Greenwich Public Schools and Library System have established their own technology strategies, it is important to recognize how the Town, Libraries and Schools can move in a common direction and leveraging the current infrastructure across a Town Municipal Area Network.

In 2001 - 2002, the Town made several key decisions regarding its core technology infrastructure, including:

- Implementing a Municipal Area Network (MAN).
- Entering into a contractual agreement to lease computer hardware.
- Migrating to the MUNIS enterprise software solution using their (Tyler Technologies) Application Service Provider (ASP) model.

These decisions remain intact and have had a significant positive impact on the technology direction of the Town. These decisions will continue to remain in effect for years to come and as a result, have been incorporated into the recommendations presented in this plan.

A. STRATEGIC PLANNING PROCESS

1. BACKGROUND

As a continuation and the second phase of the prior Technology Plan study (adopted in November, 2002), the Town of Greenwich's IT Department recognized the need to obtain another independent and outside perspective on the IT strategies for the Town. As such, the IT Department hired an outside consultant (Blum Shapiro Consulting, LLC) to develop a Strategic Technology Plan that would help identify, assess and guide various technology alternatives within the Town to support the Town's overall goals and objectives. Over the course of approximately three months the consultant conducted in-depth reviews of all Town departments to identify the current technologies implemented and confirm the new technology related requirements.

B. WHY STRATEGIC PLANNING PROCESS?

The Strategic Technology Plan will be implemented through an annual priority setting process, the development of operational work programs and annual IT budgets.

The goal of the strategic plan process was to define and coordinate how the Town should focus its resources and to provide a consistent process necessary to link the Town's various IT plans and initiatives with the goals of the community. The purpose of this document was to create an umbrella document that provides guidance and direction for the Town's IT plans, programs and services.

C. METHODOLOGY

The strategic technology plan review process focused on reviewing and assessing:

- The operational requirements of the Town of Greenwich.
- The requests by residents for access to programs, services and information.
- New technologies and technology initiatives within the Town, Schools, and Libraries.
- How to implement new strategies in the most efficient and effective manner.

The process was participative and consultative. The project team interviewed and consulted with all of the Town of Greenwich's departments. Each department was given significant opportunity to contribute their thoughts and suggestions. Focus group sessions were held with Town departments, the School District and Library to identify the key internal and external factors influencing the Town and its overall operations. The entire strategic technology plan review process was iterative in nature and overseen and guided by the IT Director.

D. STRATEGIC GOALS

The Town of Greenwich’s Strategic Technology Plan is a living document that helps to guide the Town in its planning and prioritization process over a three (3) year time frame.

These strategies (for the most part) grew out of the feedback and information from the various departments within the Town of Greenwich community (e.g. Library, School District, and Town). The strategic goals should be used as a basis for setting priorities during the annual budget process. The budget should reflect the priorities for ongoing services, as well as identifying new technology-related projects for future fiscal years. Implementing the documented technology strategies will enable the Town of Greenwich to achieve its goals and objectives by providing cost effective and quality municipal services.

In Section IV of this report, the project team identified five key strategies for the Town of Greenwich. They are:

1. Build and Support the Town-Wide Infrastructure.
2. Enhance Information Security and Compliance.
3. Reshape and Enhance Processes Through Information Technology.
4. Promote Knowledge and Understanding of Town-wide Technologies.
5. Expand Governmental Services Through Information Technology.

For each strategy, we identified the critical issues involved and provided specific recommendations.

A. Acknowledgements

Blum Shapiro would like to thank the Town of Greenwich, the Greenwich Libraries and the School District, for their participation, support, on-going dialog, and feedback during this project. A list of the project participants is provided in Appendix 7.A.

B. References

As part of this project, we also reviewed information from numerous departments within the Town, as well as information provided to us by current and prospective vendors. Outlined below is a list of vendors and information sources that contributed to this overall technology plan:

- Greenwich Library Automation Plan
- Greenwich School District Technology Plan
- Town of Greenwich 2002 Technology Plan

C. Technical Terminology

Unfortunately, in order to describe and document information in this technology plan, it was necessary, in certain instances, to use terms more technical in nature. We have made every attempt to either minimize the use of such terms or describe in detail what is meant by each term. In addition, we have included a section in Appendix 7-B that describes, in detail, the different concepts and terms used in this document.

III. Strategic Vision

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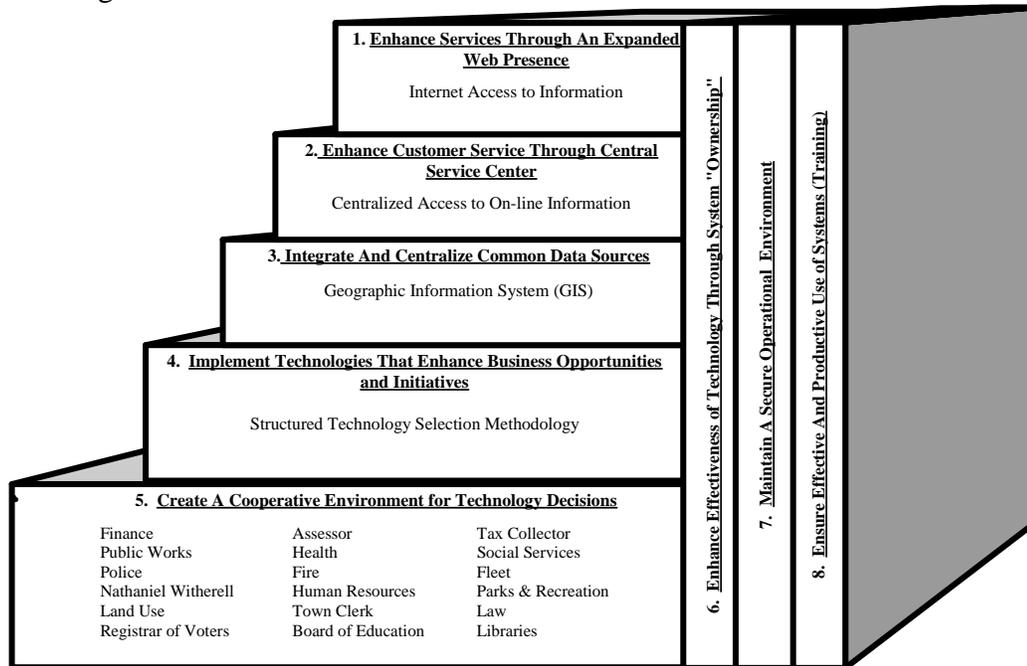
A. INTRODUCTION

As mentioned previously, in November 2002 the Town of Greenwich accepted and adopted a Strategic Technology plan that helped to identify technology initiatives and their respective capital and operating expenses.

As part of this original effort, eight (8) strategies were identified as part of the Technology Plan that helped to direct various technology initiatives within the Town. The original strategies were:

1. Enhance Services Through an Expanded Web Presence.
2. Enhance Customer Service Through Central Services Center.
3. Integrate and Centralize Common Departmental Data Sources.
4. Implement Technologies that Enhance Business Opportunities and Initiatives.
5. Create a Cooperative Environment for Technology Decisions.
6. Enhance Effectiveness of Technology Through System “Ownership”.
7. Maintain a Secure Operational Environment for Technology Systems.
8. Ensure the Effective and Productive Use of Systems.

The diagram below depicts the interrelationship between all the aforementioned strategies:



Overall, the Town and the IT Department in particular, did a very good job of directing all of their technology initiatives against these eight strategies. In Section IV of the Technology Plan, a review of the completed technology initiatives between 2003 and 2006 has been documented.

After a review of the original eight (8) strategies (in the 2002 Strategic Technology Plan) the project team decided to collapse the strategic technology vision of the Town into five (5) broad strategies. These strategies are defined on the following pages.

B. Mission Statement

As with many Towns in Connecticut, the Town of Greenwich faces many challenges to increase town-wide services while minimizing internal costs\expenses. Utilizing technology to increase the productivity and efficiency of all Town departments in a time of leveling or shrinking resources is a clear necessity and major goal of the Town. In addition, delivering services in new cost-effective ways that meet the changing needs and preferences of the Town of Greenwich's citizens is critical as well. As a result, we have developed a mission statement that supports the overall goals and objectives of the IT Department within the Town of Greenwich. The mission statement for the Town of Greenwich's IT Department is:

“Provide and support technology solutions that facilitate the integration of information within and between departments/divisions, and expand the reach and usefulness of technology to Town Residents.”

C. Vision Strategies

In order to identify new technology initiatives for the Town of Greenwich, a strategic vision was developed to help identify the necessary goals and objectives to determine how technology could be used to enhance the services and programs provided by the Town more effectively.

The objective for this vision was to define a direction for the IT Department and identify the technology initiatives and projects necessary to make this vision a reality. By considering various internal and external demands placed on the Town, such as customer service requirements, budgetary constraints and operational needs, we were able to identify the following strategies:

Strategy 1 – Build and Support the Town-Wide Infrastructure

As the overall custodian of the Town's technology, the IT Department supports a mission critical need by providing the infrastructure (a combination of telecommunications, hardware and software) that allows appropriate access to information. The IT Department must deliver quality services to departments/divisions and the public with a focus on providing convenience, reducing data redundancy, and improving security.

Strategy 2 – Enhance Information Security and Compliance

As the Town continues to expand access to data and information resources, the need to maintain a secure, controlled environment becomes increasingly more critical to ensure the integrity of the information maintained on Town systems. This requires that appropriate policies, procedures and practices be implemented and understood by all Town employees and users of Town information management resources. In addition, the maintenance of a secured environment is the responsibility of all Town users and relies on the clear communication of any activities or changes that may impact the Town’s technology infrastructure.

Strategy 3 – Reshape and Enhance Processes Through Information Technology

Technology is an enabler. It can be used as a tool to enhance Town operations and ultimately the efficiency and productivity of employees. As the Town continues to move forward with enterprise-wide technologies, it will be imperative that Departments demonstrate how new systems will improve Town operations, enhance customer service, reduce overall costs and streamline current processes. It will be critical that the goals and objectives of new technologies be identified, with appropriate cost/benefit analyses developed to identify the anticipated tangible and intangible benefits that can be expected

Strategy 4 – Promote Knowledge and Understanding of Town-Wide Technologies

The successful use of any technology tool relies heavily on the ability of users to effectively apply those tools to the processes they manage. By providing a formalized, on-going training program and instruction on all mission critical applications, the Town helps users develop the skill sets necessary to use key systems while communicating standards and developing consistent practices throughout the Town.

Strategy 5 – Expand Governmental Services Through Information Technology

One of the most effective solutions for addressing the growing demands of customer service within Town government is to expand and promote the use of the Internet as a key business and communications tool. This approach allows residents to perform many of the services offered by the Town through web-enabled and interactive applications.

IV. Findings & Recommendations

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A. OVERVIEW OF PRIOR TECHNOLOGY INITIATIVES

The Town of Greenwich's IT Department has successfully implemented many of the strategic technology and project initiatives identified in the 2002 Technology Plan. These initiatives have had significant positive impact on the overall operations within the Town. Outlined below is an overview of the major initiatives completed within the past three years.

1. Infrastructure Enhancements – Municipal Area Network

The Town of Greenwich implemented an ATM based Municipal Area Network (MAN) using Cablevision's network in November 2001. This project took 3 – 4 months to complete before most sites were on-line. This project successfully implemented the MAN for a majority of the Town's municipal locations, the Greenwich public schools and libraries. The MAN provided high-speed network access to all connected locations within the Town. As a result of the MAN the Town could provide better and more efficient access to town-wide information, including: financial, email, assessor/collector, GIS, etc. With the success of the MAN, users and departments were now able to share information and access more network based applications.

However, new demands for better performance, new applications and enhanced quality of service forced the IT Department to evaluate and consider other MAN infrastructure alternatives. In particular, the Greenwich school district wanted to implement Voice over IP (VoIP) capabilities for all of their schools and business office. This new requirement would push the limitations of the existing ATM network due to the need to have more bandwidth.

As a result, the Town's IT Department identified a new technology solution, a fiber Gigabit Ethernet network and has recently completed and implemented the MAN upgrade through Cablevision. The Town of Greenwich's new Metro Ethernet network carries all of its data and Internet traffic. As part of this effort, it connects the town's 18 municipal government facilities, 4 libraries and the school district's 11 elementary schools and 3 middle schools, as well as Greenwich High School, together. This new infrastructure can support Ethernet Virtual Circuits (EVCs) and Quality of Service (QOS) protocols to isolate and segregate voice, data and Internet traffic.

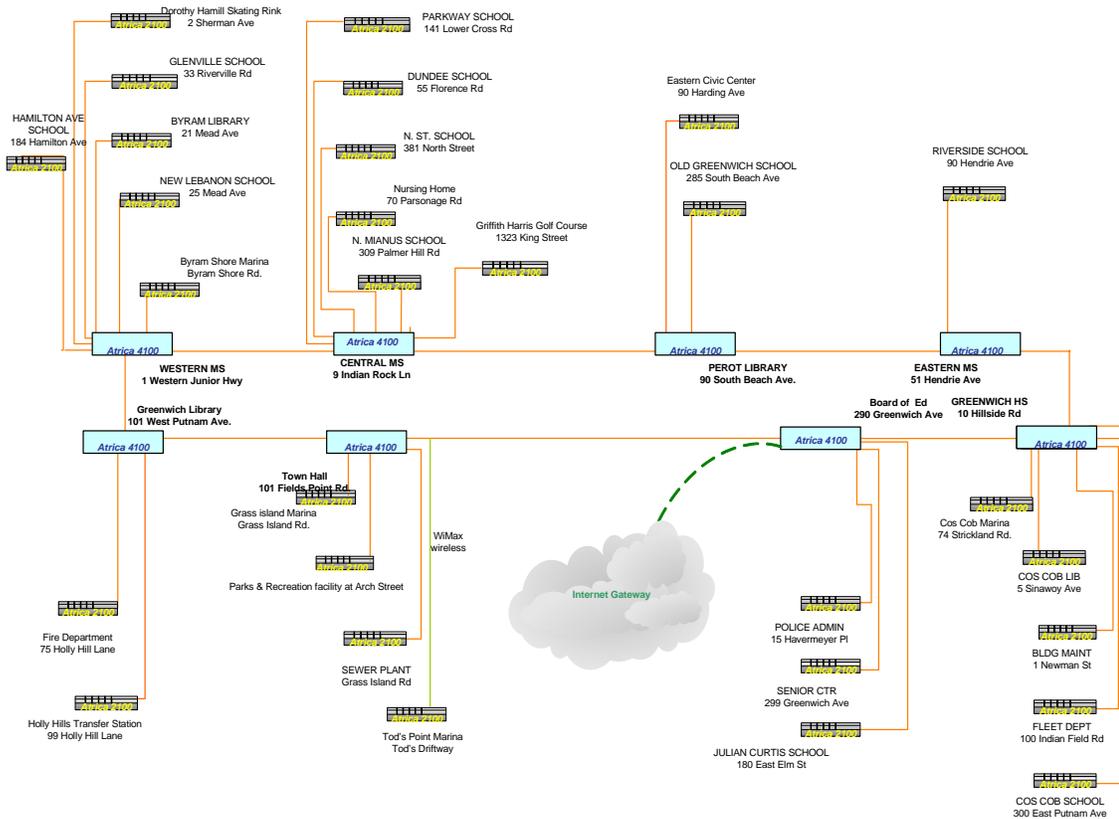
Since not all remote locations would be accessible through the Cablevision network, the IT Department identified and implemented a wireless technology solution to connect one of the Town's marinas to the rest of the network. The

Greenwich Point marina now has a WiMAX 10 Mb connection to the Town Hall and can access key applications and information on the network.

WiMAX is a wireless digital communications system, also known as IEEE 802.16, that allows remote locations to connect to other networks. WiMAX can provide broadband wireless access up to 30 miles away for fixed stations, and 3 - 10 miles away for mobile stations. In contrast, the WiFi/802.11 wireless local area network standard is limited to only 100 - 300 feet.

With WiMAX, WiFi-like data rates are supported, but the issue of interference is lessened. WiMAX is a second-generation protocol that allows for more efficient bandwidth use, interference avoidance, and is intended to allow higher data rates over longer distances.

Outlined below is an overview of the Town of Greenwich’s MAN configuration.



This diagram provides a good high-level overview of the Town’s network infrastructure. Since this new MAN provides a 1 Gigabit bandwidth, the Town of Greenwich can implement other high bandwidth applications (e.g. disaster recovery/business continuity, digital imaging) utilizing this network.

2. Infrastructure Enhancements – Server Virtualization

An initiative that the IT Department undertook over the last 12 to 18 months was the implementation of virtual server technology using VMware. Server virtualization allows different applications and even different operating systems to run simultaneously on the same enterprise-level server by partitioning the server resources into multiple virtual machines (VM). Each VM acts just like an individual, stand-alone server, but actually runs under the umbrella of one virtualized server.

Running multiple applications on a single server increases server efficiency and reduces the number of servers to be managed and maintained by the Town. When workloads increase, additional virtual servers can be quickly created in order to respond quickly to changing needs without adding new physical servers. In addition, VMware allows VM applications to be moved from one physical server to another without interruption of application service or availability. This allows an application service to continue without interruption during server maintenance, upgrade, or repair activities. Other benefits of server virtualization include:

- Providing a dynamic pool of computer resources by automatically adjusting resource requirements to another server when higher resource demands are identified.
- A VMware (virtual) server can be provisioned much faster than a physical server.
- Streamline software testing by allowing IT department personnel to create multiple environments with different operating systems and/or configurations on the same physical server.
- Simplify IT testing of patches, new applications and operating systems by allowing systems administrators to test in secure virtual machines and be able to roll back to a clean server state.
- Simplify server configurations by building a virtual machine once and deploying it multiple times.
- Evaluate software in ready-to-run virtual machines without installation and configuration of a new server. This minimizes IT resource requirements and the need to purchase “test” servers.
- Enhance maintenance of servers by minimizing the number of servers that have to be monitored and maintained.
- Provide a disaster recovery/business continuity alternative by creating VM servers located at a remote location.

Although not all applications can work in a VM environment, the IT Department has completed the migration of applications that can take advantage of the VMware technology solution.

3. Infrastructure Enhancements – Storage Area Network (SAN)

Last year, the IT Department implemented SAN technology into their IT operations. A SAN is a high-speed sub network of shared storage devices. A storage device is a machine that contains nothing but a disk or disks for storing data. A SAN's architecture works in a way that takes advantage of all storage devices available to all servers on a LAN or MAN. As more storage devices are added to a SAN, they too will be accessible from any server in the larger network. The server merely acts as a pathway between the end user and the stored data.

Because stored data does not reside directly on any of a network's servers, server power is utilized for business applications and network capacity is released to the users within the Town. The benefits of a SAN include a lower cost of ownership and an increase in the performance and availability of town-wide data storage.

4. Software Enhancements – Integrated Financial System - MUNIS

In July 2001, the Town of Greenwich implemented Integrated Financial Software from Tyler Technologies called MUNIS. The Town selected this system to replace the old in-house mainframe based financial system which could not handle the Town's growing needs. Two months later the Town implemented both the payroll and human resource modules from MUNIS as well.

MUNIS integrates information across the various functional areas including finance, operations, assessor/collector, and human resources. Presently the Town has a number of modules including (but not limited to):

- General Ledger-Accounting
- Accounts Payable
- Purchase Requisition
- Fixed Assets
- Personnel
- Cash Collection
- CT MV Administration
- MUNIS Office
- MUNIS On-line-Employees
- Budgeting
- Purchase Order
- Project Accounting
- Payroll
- Kronos Timekeeping
- CT Tax Assessment
- Utility Billing
- MUNIS On-line-Tax Inquiry
- FormMUNIS

The MUNIS ERP software solution allows for comprehensive data to be integrated from one module to other modules. Integration also allows “drill-down” capabilities, from summary to details and across related information from other modules. This integration helps to eliminate duplication of data, duplication of effort (enter data once and integrate same data with other modules) and ultimately enhances the Town's overall internal processes. It is very important to maintain this integration when ever possible. The Town of Greenwich should continue to promote and select integrated MUNIS

software modules. It should be a last resort to consider software solutions that do not integrate directly with MUNIS.

The Town leased the MUNIS application using the Application Service Provider (ASP) model from Tyler Technologies. The goal of the ASP model was to have Tyler Technologies manage the MUNIS applications from their facilities. Tyler is responsible for ongoing support, maintenance, upgrades of the applications, hardware, and operating system. They are also responsible for the backup, restoration and disaster recovery of all MUNIS information.

5. Software Enhancements – Enterprise Permit Tracking System

The Town of Greenwich was looking to expand the application/permit tracking capabilities within the Town. In addition, numerous “Land-Use” related departments were looking to expand their services both internally and to the residents of the Town. Each department was utilizing a separate method of recording and tracking application/permit information, ranging from an off-the-shelf solution, to a customized Microsoft Access database, to spreadsheet-based permit tracking systems. These “islands of information” were not integrated and/or coordinated, resulting in duplication of information and producing inefficient operations. As a result, the Town’s goals and objectives were to acquire an “off-the-shelf”, integrated, enterprise-wide permitting software solution that would have a positive operational impact on the various Land-Use departments. The departments included:

- Planning & Zoning
- Inland Wetlands
- Conservation
- Building
- Health
- Park & Recreation
- DPW-Highway
- DPW-Traffic
- DPW-Engineering
- DPW-Sewer
- Fire
- Police

After a comprehensive software selection process, the Town selected an enterprise wide permit tracking system, CityView by Municipal Software. Overall, the Permit software streamlines the process of issuing and tracking permits and automates the entire process from initial application to the issuance of the Certificate of Occupancy. Property and permit information will be instantly available, from owner and contractor information to sub permits, utility releases to expiration dates. With the CityView Permit software, departments (e.g. Building) can manage inspection scheduling and workflow, including the ability to create a daily inspection roster. This software solution also provides the following capabilities:

- Pre-generated forms and reports that enhance business processes.
- Simplify and standardize data entry with configurable lookups.
- Ability to access data via the desktop, in the field, or on the Web.
- Integrate with the Town’s ESRI GIS system and take full advantage of all mapping capabilities.
- Configure and standardize permit, letter, referral, inspection types, and fees to meet the Towns needs.
- Attach files such as site plans, digital photos and aerial photos to property information.

The Town is going to begin implementing Phase I of the CityView Permit software during the 2007 – 2008 fiscal year.

6. Software Enhancements – Integrated Email System – Lotus Notes

The Town of Greenwich had implemented Novell Groupwise to handle their email requirements in the past. Although Groupwise provided many capabilities, the software was not mainstream and the long-term stability of the company as well as the product was in question. As a result, the Town decided to evaluate other email solutions. Both Microsoft Exchange and IBM Lotus Notes were considered. Ultimately the Town selected and purchased Lotus Notes for their integrated email system. Benefits of Lotus Notes included:

- Notes provided a high level of security to protect the Town’s information.
 - Databases had several levels of security that were established for different users and/or groups.
- Notes could be configured to keep multiple copies of a single database on multiple servers or workstations. This would allow users on different networks or in various locations to access the same information.
- Mobile users could replicate a copy of their Notes email database to their laptop before leaving the office. Users could work offline on their email database to read, respond or delete email messages. Once back at their Town office, they can replicate the email database on their laptop back to the server, deleting the mail that had flagged for deletion, sending the replies, and receiving new mail.
- Notes has been created to allow for several people to collaborate on a document, review it, and make comments.
- Almost all the capabilities of Notes are now available from the Web. Notes databases are automatically converted to HTML, in real time, making it possible for users to browse or edit information in the databases on the Web.

7. Process Enhancements – Technology Steering Committee

To promote more consistent oversight to the selection, purchase and implementation of technology, the Town formalized a Technology Steering Committee. The responsibilities of the Technology Steering Committee were to:

- Evaluate a project goals, objectives and costs.
- Monitor start and completion dates of key project activities.
- Evaluate the impact a project may have on the overall schedule.
- Confirm the support resources required to successfully implement a technology and/or project.
- Identify the person(s) responsible to make the project successful.
- Promote on-going IT related communication within the Town.
- Identify on-going IT opportunities within and between departments.

The Technology Steering Committee remained in place for approximately 12 - 18 months when it was dissolved due to changes in leadership within the Town government.

8. Process Enhancements – Fax Capabilities

Having a limited number of fax machines servicing the various departments within Town Hall resulted in security, confidentiality and productivity issues. For departments with sensitive or confidential information (Health, Human Resources, Tax Collector, Town Clerk, etc.) this becomes problematic. These departments did not always have a person available to retrieve or send a fax immediately or on demand.

As a result, the Town implemented a centralized fax service in order to be able to send and receive faxes directly from a user's desktop. By centralizing this function through the Town Hall network and remote locations, user concerns regarding security and confidentiality were minimized and monitored. This also enhanced departmental efficiencies by allowing users to send/receive faxes from their desktops.

B. NEW TECHNOLOGY INITIATIVES

As part of the information gathering process to develop the technology plan, the project team interviewed personnel from all Town departments/divisions including members of the School District and Library. To better understand the functional issues confronting the Town of Greenwich from an operational and technology perspective, the project team tracked information obtained during focus group sessions, individual interviews and departmental discussions. This information was then analyzed to determine the common characteristics of the Town's needs and requirements.

Common themes raised by many groups included:

- A solid technology infrastructure presently exists.
- Access to Town information is better, but can be improved.
- User training on existing applications needs to be enhanced to take advantage of additional software functional capabilities.
- Communication between departments needs to be enhanced.
- Document storage standards need to be developed.
- Users perceive that there is a lack of reporting capabilities within MUNIS.
- Departments recognize the need to provide “self-service” alternatives to other departments and the public.

These items were repeatedly brought up as issues detrimental to a productive and efficient work environment and considered barriers to providing the level of consistently high-quality services demanded by Town Departments and residents.

Based on this, we have grouped our findings and recommendations into the following strategies:

1. Build and Support the Town-Wide Infrastructure.
2. Enhance Information Security and Compliance.
3. Reshape and Enhance Processes Through Information Technology.
4. Promote Knowledge and Understanding of Town-wide Technologies.
5. Expand Governmental Services Through Information Technology.

For each strategy, we will discuss the critical issues involved and provide specific recommendations.

1. BUILD AND SUPPORT THE TOWN-WIDE INFRASTRUCTURE

The Town of Greenwich's IT Department has done a very good job of creating a solid and flexible technology infrastructure that will grow as the needs of the Town evolve. Given the new infrastructure that has been implemented, new applications and technologies can be implemented much faster.

Many of the data sharing objectives desired by the Town have been addressed through the implementation of the MAN. Most employees not located in Town Hall have access to common data, applications and other information resources through the MAN. Benefits include:

- Centralized access to critical applications; including: Email, Financials, Permit tracking and GIS.
 - Reduction in the number of independent and separate databases/spreadsheets created to track information.
- Elimination of many communication and operational obstacles.
 - Ability to share documents with other remote departments.

With many technology solutions available to the Town of Greenwich (e.g.: fiber, wireless, cable modem, etc.) the Town can connect any remote location to the MAN. However, as identified by the IT Department, a cost-benefit analysis must be performed in order to justify new MAN connections. In addition, other Town telecommunication alternatives (e.g. VPN) exist, which provide similar functionality but at a lower cost. The Town should continue to evaluate any proposed MAN connections and confirm that they are cost justifiable.

Recommendation – Implement a Business Continuity Plan and Integrate with the Town's Emergency Preparedness Program

Over the past several years, the Town of Greenwich has recognized the need to have a Disaster Recovery/Business Continuity Plan. Reasons to develop and implement a plan included:

- Increased dependency by the Town departments on computerized business operations, thereby creating increased risk of loss of normal services and revenue collection.
- Increased dependency by the Town on computerized information systems.
- Need to develop effective back up and recovery strategies to mitigate the impact of disruptive or disastrous events.

In addition, the Town has dedicated full time resources to assist with the creation of an Emergency Preparedness and Management program. The Business Continuity plan should be incorporated into the Emergency Preparedness program.

A Business Continuity plan is a pre-mediated strategy for continued business operations within Town Hall in the event of a disaster. While never a guarantee that a Town's business operations affected by disaster will go completely as planned, developing a Continuity Plan will help the Town to minimize disruption to their operations and help anticipate the actions the Town will need to take in the event of a disaster.

As part of this effort, and to take advantage of the enhanced infrastructure within the Town, the IT Department should continue to create a "Hot Site" at one of their offsite Town buildings. Using existing technologies (i.e. VMware, SAN technologies) the Town can implement a Business Continuity plan with limited disruption to operations or service.

Having virtualized servers as part of the Business Continuity plan can provide a simpler, more reliable and better cost savings for the Town.

- Recover from disasters quickly - Utilizing VMware's capabilities, VM servers can be located at an offsite Town building and take advantage of a virtual machine's file encapsulation, which reduces a server to a set of files which can be restored easily and quickly.
- Reduce the cost of disaster recovery – With VMware's virtual server capabilities, recovery of applications/data onto other virtual machines instead of specific dedicated physical servers can minimize costs.
- Simplify the disaster recovery process – Instead of having recovery servers using VMware, the Town can utilize currently available servers. Testing can also be performed in a virtualized environment allowing confirmation that the business continuity plan is effective.

Recommendation – Design and Implement a Town-Wide Wireless Communications Strategy

With the implementation of enterprise-wide applications and the need to perform more work from the field, the Town of Greenwich needs to consider new technologies that would provide wireless network access.

Throughout the interview process, there were a number of departmental personnel that recognized the advantages of accessing network information while performing their daily duties within the Town of Greenwich. This includes the following:

- Building Inspectors could perform more inspections and have better information accuracy if they could have tablets/notebooks and be able to access permit information from the field.
- Assessor’s office could utilize permit tracking and assessor information while evaluating properties within the Town.
- Health department could review prior health inspections and have access to other critical information in the field.
- Fire Department personnel would greatly benefit from GIS and other relevant information from the field.

The Town of Greenwich should evaluate different wireless technologies to identify the best solution for the Towns needs. Outlined below is a brief overview of the WiMax technology.

a. Consider Implementing WiMAX as a Town-Wide Wireless Strategy

As previously identified, the Town of Greenwich has already implemented a WiMAX 10 Mb connection between the Greenwich Todd’s Point Marina and the Town Hall. WiMAX can provide broadband wireless access up to 30 miles for fixed stations, and 3 - 10 miles for mobile stations. It can carry much higher volumes of data (as compared to WiFi) over distances up to 30 miles, offering business applications and VoIP as well as Internet access.

WiMAX is emerging as one of the dominant wireless technologies because of its advantages including: lower expense and quicker deployment, less interference, cheaper maintenance, greater range, and the ability to handle voice, data, and video simultaneously. WiMAX technologies can allow all Town and law enforcement officials to collaborate and share information provided over a pure IP network.

In addition, a brief research of WiMAX technology initiatives has proven that various communities are evaluating this wireless technology as a free or lower cost Internet access solution to its residents and with the ultimate goal of improving the efficiency of services.

2. ENHANCE INFORMATION SECURITY AND COMPLIANCE

a. Information Security

With the implementation of the MAN, wireless access points, web services and other technologies, the Town of Greenwich needs to constantly evaluate their security protocols. The Town has implemented a variety of security measures (e.g. firewalls monitored by Lightpath, virus protection software, etc.) but should consider additional alternatives.

Recently (January 2007), the Town of Greenwich's IT Department implemented an intrusion detection/prevention system (IPS) to constantly monitor and evaluate the network infrastructure. The TippingPoint system inspects all inbound and outbound network activity and identifies suspicious patterns that may indicate a network or system attack from someone attempting to break into or compromise the Town's systems. The software then helps prevent an attack from occurring.

An IPS differs from a firewall in that a firewall looks out for intrusions in order to stop it from happening. The firewall limits the access between networks in order to prevent intrusion and does not signal an attack from inside the network. An IPS evaluates a suspected intrusion once it has taken place and would signal the IT Department of a potential intrusion.

Using the TippingPoint solution, the IT Department found suspicious network activity and was able to successfully eliminate potential threats. This tool remains in place and is constantly monitoring the Town of Greenwich network.

Recommendation – Perform a Data Security Assessment

Based on the implementation of new technologies (e.g. MAN, WiMAX, wireless access points, etc.) the Town should contract with a data security specialist and perform a comprehensive information security review every two (2) years. The last security assessment performed within the Town dates back to August 2003.

This assessment should review the preventative and detective controls over Town systems to confirm their effectiveness within the MAN infrastructure environment. The objective of this assessment will be to review the current approach to data security and identify potential risks to Town data resources. Results of the study should provide recommendations for eliminating exposures to internal and external threats, and enhancing current data security procedures.

Recommendation - Develop Technology and Operational Policies and Procedures

The Town of Greenwich has adopted some standard policies designed to help direct and secure the use of Town resources. However, with the introduction of the MAN, enterprise applications and other new technologies, specific policies and procedures have not been fully established to ensure the security of the Town's information.

The Town should enhance the standard policies and procedures to secure and protect its information. These policies should be concerned with security of the network and protecting Town data. The policies should include:

- Privacy of personal resident data maintained on Town systems.
- Security measures to be taken to protect data.
- Who should be given access to different types of data.
- Appropriate penalties for abuses of access privileges.
- How network security will be implemented (i.e. password rotation, sharing of passwords).
- Sharing of Town information.

As part of the annual HR review/evaluation process, each employee should sign-off on the security policies to confirm their acceptance, knowledge and understanding of these policies.

b. Information Compliance – Freedom of Information Act

As with all local municipalities, the Town of Greenwich must comply with information requests and other state/federal standards/protocols. One such standard is the Freedom of Information (FOI) request. The FOI standard requires that a public agency (e.g. Town of Greenwich) provides to a person making a request a copy of nonexempt information. The Freedom of Information Act does not require the disclosure of information in the following situations:

- Personnel or medical files.
- Records of law enforcement agencies.
- Records pertaining to strategy and negotiations with respect to pending claims or pending litigation.
- Trade secrets.
- Commercial or financial information given in confidence.
- Test questions (i.e. licensing examination).
- Privileged attorney-client relationship information.
- Names or addresses of students enrolled in public school.
- Information technology records that could compromise the security or integrity of a technology system.

The Town has had a number of Freedom of Information requests over the years. The IT Department has worked well with the First Selectman's Office and Law Department to satisfy these requests. The IT Department should continue working with these departments to coordinate all FOI requests and to make sure they are in compliance with all FOI rules.

c. **Information Compliance – Electronic Discovery**

A new compliance standard, electronic discovery, was introduced in December 2006 by the Federal Courts. Electronic discovery (also called eDiscovery) refers to any process in which electronic data is sought, located, secured, and searched with the intent of using it as evidence in a civil or criminal legal case (currently Federal cases). E-discovery is incorporated as part of the Federal Rules of Civil Procedure.

In the process of electronic discovery, data of all types can serve as evidence. This can include text, images, calendar files, databases, spreadsheets, audio files, Web sites, and computer programs. Even malware such as viruses, Trojans, and spyware can be secured and investigated. Electronic mail (email) can be an especially valuable source of evidence in civil or criminal litigation.

One of the most important issues today is compliance with electronic data preservation and discovery. Attorneys are now required to include electronically stored information in initial disclosures and hold an early pre-discovery conference to agree on what data is reasonably accessible.

As it relates to the Town of Greenwich, internal IT Department personnel are responsible for preserving and collecting the required data from various sources such as networks, hard drives, backup tapes, CDs and work stations. The integrity of the data being collected is critical since questions will surface regarding the approach and techniques of the collection process. Assurance that data is pristine and all data collection requirements are properly met is essential.

One of the biggest challenges is for the parties to discuss electronic discovery well in advance of a trial and identify issues such as form of production, data preservation, and privilege waiver. It is up to the IT Department to produce electronically stored information in a variety of forms, requiring choices and judgments that were not originally present in paper discovery.

Recommendation – Develop an eDiscovery Plan

The IT Department has taken a proactive approach to implement some eDiscovery standards within the Town. In particular, the IT Department implemented an email storage and archiving solution. As a result all incoming/outgoing emails are archived when sent/received. The Town should

also develop a formalized plan on how other types of electronic documents will be saved and preserved. Timing and preservation of evidence is crucial. As part of this effort, the Town should work with the Law Department and confirm the appropriate steps and actions needed to comply with an e-Discovery plan.

3. RESHAPE AND ENHANCE PROCESSES THROUGH INFORMATION TECHNOLOGY

The Town has recognized the need to select and integrate software application solutions across the enterprise rather than focusing on individual department solutions. This approach has had (and will continue to have) a positive impact on the overall operations within the Town. The selection of MUNIS, GIS, a Permit Tracking solution and the proposed selection of a Digital Imaging system represent examples of enterprise wide initiatives. All of these solutions will help enhance and reshape both the internal and external operations within the Town of Greenwich.

a. **Permit Tracking Overview**

A permit tracking software solution will electronically track and manage all land use and community development activities including permits, building safety, inspections, investigations and reviews, zoning, project plans, and code enforcement. It allows staff to have access to input data, verify activities, check permit status, and obtain complete parcel information instantly. With this solution, one of the goals is to speed up the process of getting from application to occupancy, while reducing errors and data redundancy within a single database. Other goals of the permit tracking solution include:

- Automation of various steps/tasks involved with completing a permit - application check-in, plan reviews, fee calculation and collection, inspections and investigations, and sign-offs.
- Better management of resources by utilizing the capabilities of the system to assign, schedule, and route assignments to the appropriate person, while defining the sequence of tasks to mimic each department's existing workflow.
- Better integration and communication of land use departments so Department personnel have access to property information including: plan guidelines—grant variances, set conditions, historical and environmental issues, departmental reviews, and appeals
- Enhance mobile inspections through the use of a tablet or other mobile device. Field inspectors can interact with the Town's database in real time, access their daily inspection schedules, create new cases in the field, and submit inspection results remotely.

Recommendation – Create An Integrated Permit Tracking Process

Even though the Town is in the process of implementing a new permit tracking solution, it is imperative for the Town to design and document a comprehensive permit tracking process. Simply taking the individual processes that each department utilized in the past will not effectively or efficiently take advantage of the new system. The Land Use departments need to get together to discuss integrating their various services into a process for both residents and customers to use.

Recommendation – Purchase and Implement Mobile Permit Tracking Capabilities

After the initial implementation phase of the permit tracking system, the Town should consider implementing mobile technology for field use. Building inspectors and other departments would significantly benefit from having access to property information in the field. This recommendation is in conjunction with “Wireless” recommendation made earlier in this document.

b. Digital Document Management Overview

During the interview process, it was confirmed by a majority of the Town and School Departments that a key concern was the ongoing storage and retrieval of documents; both in hardcopy and electronic. Within the Town, each department stored and tracked their own documents, while within the School District documents were stored collectively in the attic/basement but with no structure or strategy. Implementing a digital imaging solution that spans all Departments will significantly enhance the document storage capabilities of the Town. The goals and objectives of this effort will be:

- To implement a cost-effective method of document imaging.
- To establish a common database for the storage, retention, and searchable recall of all documents housed by the Town of Greenwich and the School District.
- To identify a software solution that allows for future growth and expansion of all document imaging efforts.
- An easy to use, graphical user interface that allows for varying levels of computer expertise and a system that allows direct online access with varying degrees of security according to document sensitivity as determined by the Town and School District policies

Through the help of an outside consultant, the IT Department evaluated the digital document management requirements of the Town. As part of this effort a list of all document types was developed and an estimated number of

documents determined. The Town approved an initial request to fund and implement a new digital imaging and archiving solution. Further recommendations are as follows:

Recommendation – Create An Integrated Document Management Storage Process(es).

After the Town selects a digital document management software solution, it will be important to design and develop processes that direct the following:

- How documents will be stored (determining indices)?
- Who will image the documents?
- How will documents be archived/deleted?
- How will confidential documents be stored and retrieved?
- Who is responsible for sending document destruction forms to the State?

These and many other questions and implementation standards need to be determined as part of a joint effort between all Town and School departments.

Recommendation - Develop Document Storage and Management Standards

Standardizing document formats and managing the placement or location of electronic documents will be extremely important to the Town. We recommend that the Town establish a Digital Imaging User Group. This Group would help establish a core set of standards for the Town/Schools regarding the directory and file management structure. As part of this process, this group should perform the following:

- i. The advent of the MAN increases the need to effectively file and manage documents. As the number of resources available through the MAN increase, it will be critical that document storage standards be in place. All users will be responsible for storing documents in specified locations (i.e., drives, folders and subfolders) on the Town’s network. The User Group should evaluate the current file management approach to develop a unified, high-level strategy for all departments, identifying how and where information should be stored, and then communicate these standards to all users. The User Group should then work with the IT Department to ensure adherence to this standard.

By standardizing and centralizing the storage of documents, the Town will minimize duplication of efforts and enhance user access to common documents (assuming a user has the appropriate level of security). In addition, centralizing the storage of documents will improve the Town’s data recovery capabilities through nightly back up of all documents on the network.

With the implementation of a document storage strategy, the Town should then develop an archiving strategy that provides direction and guidelines

for managing files and data that will be migrated from the main directory structure to the new imaging/archiving system. This strategy should identify the Town's approach to cycling data from the Town's network to near-line and off-line formats (i.e., optical storage, backup tapes, etc.) and the procedures for accessing this data once archived.

c. MUNIS Overview

The MUNIS software solution has been implemented on an enterprise wide basis. Key modules that have been introduced include: Finance/Accounting, Budgeting, Payroll/Personnel, Assessor/Collector, and Requisition/Purchase Orders/Accounts Payable. During the interview process, there were several key discussion points that were directly attributable to the MUNIS software. Outlined below are these summarized discussion points.

- i. The software modules associated with the Tax Assessor and Collector does not meet the Town's needs. The Tax Assessor in particular, does not feel that the MUNIS solution incorporates Connecticut's statutes appropriately. The Assessor has had difficulty producing a clean Grand List. Discussions with other Connecticut communities confirmed that other Cities/Towns using the MUNIS Tax solution are having similar difficulties with its functional capabilities.

It was discovered during the interview process that the Assessor was actively evaluating another Tax Assessor software solution. Attempting to implement a different software solution would, at the very least, impact the Town's approach to more enterprise-wide software solutions. It is premature to consider a new software solution at this time. Further analysis and discussion must be held with MUNIS (Tyler Corporation) before an evaluation of additional software should be made.

- ii. Reporting within MUNIS has been challenging for many departments. Many interviewees expressed concerns with the available reports not meeting their needs. Users are frustrated with the reporting process. They know that the information exists within MUNIS, but are unable to extract it into a usable format.

- iii. Many of the departments recognize that MUNIS had many more functional capabilities than they were using and requested additional and on-going training, specifically in the areas of purchase orders, budgeting, general ledger reports, and exporting information. In addition, when MUNIS software upgrades are implemented, additional training should be provided.
- iv. Other departments also recognized that the Town has either not purchased or the Town is not utilizing some of the MUNIS software modules that would be advantageous. Examples of this include:
 - Human Resources has been using the payroll capabilities of the system, but is not taking full advantage of the HR module. MUNIS has been hired and is in the process of providing training and knowledge transfer on many of the functional capabilities of the HR module.
 - Fixed Asset module was purchased but not utilized.
 - No bid-tracking capabilities currently exist. The Purchasing Department did review and evaluate this module through MUNIS several years ago.

Recommendation – Confirm Capabilities of the MUNIS Tax Software Module(s)

As indicated previously, there have been concerns related to the Tax Assessor/Collector’s functional capabilities. Since this a critical operational area, further evaluation of both the requirements and functional capabilities should be investigated. In particular, the Tax Assessor and Tax Collector should document their concerns and perceived software limitations. A meeting with MUNIS management should be initiated and a review of these problems communicated with this team. Once a more detailed evaluation has been performed in collaboration with MUNIS, the Town can better define the appropriate course of action. At this time, we recommend that the Tax Assessor suspend the review and evaluation of other software and instead focus their attention on working with MUNIS to resolve any functionality gaps.

Recommendation – Evaluate and Consider Purchasing/Implementing Additional MUNIS Module(s)

There were several goals identified as part of the implementation of MUNIS, including improving internal efficiencies, reducing manual paperwork, and providing on-line access to key information. These improvements have been a key to enabling the Town to minimize/reduce FTEs in the last couple of years. To this end, the Town of Greenwich should consider purchasing additional MUNIS modules.

- i. **MUNIS Self Service for Employees** - This module will extend access to MUNIS information via the Internet. It can alleviate routine requests for information by having the data accessible online and give employees convenient access to view their employee information. MUNIS Self Service automates an employee's leave request to online supervisory approval, eliminating paper forms and then automatically adds the entry to the Payroll batch. This will eliminate the time and attendance clerk from duplicating keying these entries.

The online benefit enrollment capabilities can save time for Human Resources and Payroll. HR will be able to easily monitor open enrollment forms and produce company required forms if needed for employee signatures. The new deduction information will then automatically update into MUNIS employee master files. The Town has already purchased this module, however it has not been implemented yet. The Human Resources department should review the functional capabilities of this module and develop an implementation plan to make available the self-service capabilities as described above.

- ii. **Report Writing** – Being able to report on and/or extract information within MUNIS is critical. Most Town departments and users of MUNIS have requested additional report writing capabilities be implemented. The Town should consider purchasing Crystal Reports (by Business Objects) to implement as the report writer for MUNIS. This software can provide users with the ability to access and produce accurate reports using information directly from the MUNIS database. Within the MUNIS Crystal Reports capabilities, security to information is also maintained by module and at the record level (if required). In addition, MUNIS has established and maintains a library of shared Crystal Reports on their website for various departments to copy and use.

Another alternative that has not been fully utilized are the data extraction and report writing service of both the IT and Finance departments. Both these groups have internal personnel that can extract MUNIS data into a wide variety of reports or other file types. The Finance department in particular, extracts financial information into a Microsoft Access database on a regular basis. The implementation of a MUNIS User Group could help identify and deliver some of these reporting needs.

- iii. **Bid Management** - The MUNIS Bid Management module can help automate the procurement and buying process within the Town of Greenwich. A Bid Management software system can help manage and track key information required for all bids processed by the Town. Once a bid is awarded, and since the module is integrated with MUNIS, a Purchase Order can automatically be created. The Purchasing Department should reevaluate this software module and consider integrating it into the MUNIS enterprise software solution.

d. GIS Overview

The GIS at present is used for a variety of property and land use purposes, including creating maps for the public, site plan reviews, planning and zoning analysis, and assessment reports. There are over forty regular users of the GIS software who have varying degrees of skill with the functions and features of the system.

There are many layers in place, including the digitized aerial maps, town facilities, property lines, etc. The Town of Greenwich continues to enhance and improve on the accuracy of the GIS information. The Town has also adopted the approach to utilize and integrate GIS into enterprise wide applications. As a result, one of the core requirements of the new permit tracking solution is the integration with the Town's GIS ESRI solution.

The future of the Town's GIS is two fold: expand the layers presently available to GIS users and continue to enhance the quality of GIS information.

Recommendation – Document and Communicate a GIS Plan

During our discussions with the various interviewees, it was clear that many people were unaware of the Town's GIS direction or GIS initiatives for the ongoing development of the application. However, a User Group has been established that meets on a regular basis (every 3 months) with the GIS Coordinator to provide direction and guidance to all GIS initiatives

We recommend that the GIS Coordinator, in collaboration with the respective User Group, document a GIS plan that will serve as a roadmap for GIS initiatives. Layers to be considered as part of the GIS initiative are outlined below (this was based on feedback from various departments during the interview sessions):

- Northeast Utilities layer
- Public safety incidents
- Drainage boundaries
- Hydraulic models

Recommendation – Perform a GIS Based Aerial Fly-Over

The Town of Greenwich has been successfully using GIS for many years. Many Town departments and residents rely on this valuable information. With the introduction of a new integrated permitting software solution, more reliance will be placed on the integrity and accuracy of the GIS information. As a result, and based on suggestions from the GIS User Group, the Town

should consider investing in an aerial fly-over that would be performed on a regular basis.

An aerial fly-over is essential to produce a digital geographic (planimetric) base map. This digital map must be maintained and updated to reflect changes such as new roadway and housing construction. Although property line changes have been kept current, other base-map features are only current to the date of the initial fly-over. Any road or building constructed after that date will not appear in the base-map unless added by hand. The most expedient and cost effective method of update is via a fly-over wherein changes in features can be identified and added. We recommend that the Town consider a fly-over every five (5) years. This would provide a mechanism to maintain and keep the GIS base map up to date and accurate.

e. User Groups

With the Town’s enterprise approach to applications, it is critical to implement and maintain a collaboration process that will bring the various departments together to structure, configure and develop a unified process for the Town. As an example, with the implementation of the Permit Tracking system, global configuration settings need to be implemented; new policies and procedures need to be developed both internally and externally; new processes need to be designed and documented for Town employees and residents; and future changes need to be evaluated based on the impact to other departments and ultimately to the Town.

Recommendation – Implement User Groups For Each Enterprise Application to Provide and Promote Consistent Oversight

These types of discussions need to be formalized and a process implemented to enhance the usage and capabilities of the respective applications and also to protect the respective software investment. As a result, we recommend the following:

In order to provide consistent oversight to the configurations, modifications processes and future growth, the Town should consider formalizing a User Group for each Enterprise wide application. The User Groups that should be initiated include:

- Permit Tracking
- Digital Imaging and Archiving
- MUNIS – Purchasing
- MUNIS - Reporting
- GIS
- Website

The responsibilities of each User Group will be to:

- Evaluate each applications goals and objectives in order to determine how the success of the application can be measured.
- Configure the respective application in a collaborative environment so additions/modifications will not impact other departments.
- Develop and document processes that will incorporate the various tasks and steps of each participating department.
- Monitor start and completion dates of new activities.
- Confirm the support resources required to successfully implement and/or make changes to the application.
- Identify the person(s) who will oversee the ongoing changes to the application and make the implementation successful.

In this capacity, each User Group can be more responsive to the needs of the various departments, the Town and its residents. As the use of technology grows, each User Group will be in a better position to proactively oversee and implement the changes necessary to support the goals of the Town. A User Group should be composed of those departments that utilize the various software solutions identified above.

The IT Department should participate in each User Group, providing guidance and technical support as required. However, it is not up to the IT Department to set direction and/or strategy

f. Internal Town Communications

During the interview process, it became apparent that many departmental users were unclear about various technology and operational initiatives within the Town. In addition, many complained that there had not been enough communication and/or collaboration regarding some of the technology projects. The IT Department has created an Intranet to better communicate and utilize technology tools within the Town. However, not many town departments or users are aware of these intranet capabilities.

Recommendation – Enhance and Better Utilize the Town’s Intranet

An Intranet provides access to information for internal personnel only. In the case of a municipality, an Intranet can optimize a user’s ability to access data across the network and collaborate with others. An Intranet utilizes the existing network infrastructure in this case, the Town of Greenwich’s MAN. The Intranet within the Town can provide employees access to key internal operational information such as:

- i. Providing a Knowledge Base application which can assist in supplementing the workload of the Town’s IT department. By creating an online Knowledge Base for information on troubleshooting, solutions to common issues, how-to’s, tips on using software or hardware, and a review of frequently asked Help Desk questions, users could be more self-sufficient.
- ii. Keeping track of suggestions for the various Town Departments could enhance overall internal operations. An Intranet could be configured to maintain suggestions what steps were taken for implementation.
- iii. Viewing at a glance any new content that is being published to the site, as well as set alerts for new and updated content in defined areas throughout the site. The “What’s New” section could provide current, relevant and new information to all Town employees.
- iv. Keeping track of available training courses and class registrants could be beneficial. Users can register for courses online through a Training application. Users could:
 - Have access to an online Training Calendar.
 - Electronically register for courses.
 - Confirm registrant status for course completed, incomplete, cancelled, or no show.
- v. Providing a central repository to provide users access to all of the Towns policies and procedures. These policies could be organized by category, sub-category and department. Employees could use a local search function within Policies for quick and easy retrieval.
- vi. Providing an online discussion platform to encourage and manage online text discussions over a period of time among members of departments or project teams.

The Town should implement this Intranet through a consistent web portal that internal users access through their daily use of Town applications and/or the Intranet. This portal should be a “one-stop” web page that communicates all aspects of the Town’s services, applications, news and policies/procedures to the user community. Key sections of the portal may include:

- MyApplications – Hot links to applications available to users.
- MyHelpDesk Request – List and status of help desk requests.
- HR News – Access to various elements of HR information including new hires, retirements and other key information.
- MyPolicies – Links to both Departmental and Town policies and procedures.
- Job Posting Board – List of all current open jobs available within the Town.
- Suggestion Board – Ability to provide suggestions to Town Departments.
- Training Board – Ability to signup for training programs.
- Town News – List of Town news and/or events.
- Town Project – List of key Town projects (e.g.: Technology, Public Works).

As part of this effort the IT Department should work with the individual departments to confirm how the informational contents of the portal will be constantly updated. This will help to enhance overall communications between and within the various Town departments.

Recommendation - Develop an Implementation Schedule Identifying Critical Tasks and Completion Dates for all Technology Initiatives

The newly created User Groups should work with the IT Department to develop a detailed implementation schedule for all current and planned technology projects. Creating and communicating such a plan on a regular basis establishes a priority list of activities under development and appropriately sets the expectations of Town employees. Users can better plan their departmental schedules based on the implementation of new system features and capabilities. In addition, an implementation schedule should identify the “owners” of each project as well as provide key target dates for vendors to meet. This capability could be integrated into the Town’s Intranet Portal.

4. PROMOTE KNOWLEDGE AND UNDERSTANDING OF TOWN WIDE TECHNOLOGIES

The Town of Greenwich has made a significant investment in various technology tools over the past five years. A key component to the successful implementation and use of technologies is adequate and ongoing training. However, a criticism from many of the Town’s departments is the lack of training opportunities provided by the IT Department.

Discussions with the IT Department confirmed that they have provided specialized training courses on Lotus Notes (email), Fax services, and application specific training. Some generic training on Windows and MS-Office has also been provided. Computer based training for all Microsoft products is available but not utilized.

This has resulted in the following:

- a. Limited training has minimized the level of standards maintained within the departments and the Town as a whole.
- b. Users require greater levels of support to answer basic questions on application use. This drain on limited support resources has a domino effect to other more critical projects to which time cannot be committed.

Recommendation – Coordinate and Communicate Training Programs with Human Resources

The IT Department should work with the Human Resource Department to structure training programs that effectively meet the needs of the Town's employees. To date, the IT Department has made several attempts to provide training alternatives to employees, but unfortunately very few people have taken advantage of these training offerings. A collaborative effort between IT and HR to develop a comprehensive training program should be considered.

The training program should be an ongoing, incremental program throughout the year. Each training class should contain enough material for a 3 - 4 hour session. Training classes should be tailored to the Town's needs and requirements of that application to ensure that the software is effectively and efficiently utilized.

In addition, the Town's new employee orientation program should include requisite training on the use of technology and systems within the Town. This overview class should provide new staff with an understanding of the Town's network, general applications (electronic mail, Internet), data management standards (e.g., directory structure, file naming conventions, etc.) and data security.

Recommendation – Provide Training Sessions on Key Applications

The individual User Groups should be responsible for overseeing and obtaining training on key applications for their respective user base. Each User Group should coordinate with their respective vendor and have them provide the appropriate training for their application. In particular, users requested training in the following areas:

- MUNIS – Purchase order process.
- MUNIS – Budgeting.
- MUNIS – Report writing tools.
- GIS – On-line inquiry and access.

Recommendation – Ensure IT Staff Attend Regular Technical Training Classes

As the Town begins to implement more sophisticated technologies, such as Windows XP/Vista and the MAN, it will be crucial that the IT staff regularly attend appropriate training classes to ensure they have the skill sets necessary to sufficiently support these new systems and, most importantly, the Town's users.

We also recommend that IT staff attend key seminars and technical conferences to help keep them current with both existing and new technologies that may benefit the Town. Staff should also be encouraged to obtain any supplemental certifications, such as a Microsoft Certified Software Engineer (MCSE), or expertise with key systems and protocols, such as SQL Server or TCP/IP, that would enhance their level of skills, expertise and ability to provide continuous high quality service to the Town.

5. EXPAND GOVERNMENTAL SERVICES THROUGH INFORMATION TECHNOLOGY

Over the past several years the Town has provided some on-line access to information and services. In particular, residents can pay taxes, pay parking tickets, obtain forms (somewhat limited) and sign-up for certain programs (e.g., Golf, Emergency Preparedness Email) through the Town's website.

In addition, the Town has implemented on-line customer service request capabilities. This allows residents to request a service or report a Town related problem via the Internet, 24 hours per day, seven days a week. However, the website interaction is limited and not fully conducive to other types of web services.

With the implementation of new enterprise wide software applications (e.g., permit tracking, digital document management, etc.) the Town should now consider enhancing access to these and other systems as part of their strategic technology initiative of Expanding Governmental Services. Many communities are calling this e-Government or the Virtual Town Hall. No matter the name, the goal of such an initiative should be to:

- Enhance Town Hall office hours to access or retrieve information.
- Eliminate the need for residents or vendors to go to Town Hall and sign-up for programs, permits, etc.
- Provide more immediate information to residents.

The Town of Greenwich should continue to enhance their services through the Internet. As new applications and/or "virtual" services are developed, the Town should incorporate these into the overall service offerings on their website.

Outlined below are recommendations to enhancing governmental services.

Recommendation - Develop a Strategic Web Site Plan

In conjunction with the services offered through the website, we recommend that the Town document a comprehensive Strategic Web Site Plan that identifies the goals, objectives and priorities for developing and enhancing the Town's use of the Internet as a complete, interactive business tool. Elements of this plan should address:

- Web site design standards.
- Web site support and enhancement requirements.
- Integration of data systems and business processes including (but not limited to) GIS, permit tracking, document management, etc.
- Potential integration opportunities with the Library and School District applications.
- Information submission and publishing procedures.
- On-line payment processing standards and requirements.
- Technology requirements (use of Lotus Notes or other web based application).
- Cost/Benefit analyses.
- Implementation scheduling.

By having a structured, documented approach, the Town will be able to identify new opportunities and better plan for enhancements for the overall web site projects.

Recommendation – Create a Website Oversight Committee

At this time the website development efforts are solely in the hands and the responsibility of the IT Department. This group handles some of the website design and maintenance efforts and is supplemented by a third party website development vendor. Although this situation has worked well for the initial development of a comprehensive website, the ongoing maintenance and future direction for the website should not be controlled by a single department.

As such, the Town of Greenwich should create a Website Oversight Committee to help direct all website initiatives. This group coupled with a strategic vision and plan for the website will help enhance the continued use of this technology tool. One of the goals of this committee should be a plan to keep the contents of the website “fresh” and up-to-date. This will help provide residents with timely information and Town services.

V. Implementation

V. Implementation

A. Schedule and Costs

We recommend a phased approach to implement the technologies proposed in the Strategic Plan. This approach takes into account the cost and resource constraints the Town faces. By initially developing a core technological foundation for the Town, new hardware, software and other technological capabilities can be implemented incrementally over the next three years.

Key items for each year are outlined below. Cost summary and line item detail information is also provided in Exhibit 5-A at the end of this section.

<u>Costs</u>	<u>Year 0</u>	<u>Year 1</u>	<u>Year 2</u>	<u>Year 3</u>
Total	\$3,690,800	\$3,341,000	\$3,881,963	\$3,558,783

Assumptions and Notes:

- The Town of Greenwich has decided to lease computer hardware. This includes both servers and personal computers. To develop some of the costs we configured PCs utilizing the Dell website data and applied a three year lease payment schedule.
- The financial information identified in Year zero (0) represents on-going technology projects for the current fiscal year. Most of these projects have already been budgeted for with the monies approved and allocated.
- Included in the cost estimates are previously approved and budgeted technology projects. This includes some funding for the Enterprise Permit Tracking and Digital Imaging and Archiving systems.

Year Zero (Fiscal Year 2007 - 2008)

Presently, the Town of Greenwich has implemented the Municipal Area Network (MAN). As identified previously, the MAN will connect all Town Hall departments, Libraries and the School District electronically. Other major activities included in this current year are:

- The Land-Use Departments implement a new enterprise wide Permit Tracking software solution. This software will allow multiple departments to track and maintain permits throughout a permit's life cycle. It will also provide a direct link to the Town's GIS system. As part of this effort, a User Group committee is formed to help develop standards among various departments involved in the project. A new IVR system is introduced as part of this solution
- A software selection project will be initiated to select a new Digital Imaging and Archiving solution. During this phase, it is also a goal to select and begin the implementation of this new system. As part of this effort, a User Group committee is formed to help develop standards among the various departments involved in the project.
- To enhance the GIS, the Town of Greenwich will hire an outside firm to update the Town's GIS data and digital map information.

- To enhance the utilization of the MUNIS Tax system, additional training will be purchased and provided by the vendor.
- Ongoing technical training will be provided to the IT personnel. This training will occur in all subsequent years.
- The Town should work with MUNIS to identify the requirements and open issues of the Tax Assessor/Collector offices. The intent of this project is to recommend functional changes to the MUNIS Assessor/Tax modules. This will help alleviate ongoing staff concerns and help identify an approach to resolving the current issues with these modules.

Year One (Fiscal Year 2008 - 2009)

By the end of Year One (1) the Town should expect to fully implement the Permit Tracking system. The digital imaging system implementation will be well under way as well. Major activities included in this year are:

- After a review of the needs and requirements of the Tax Assessor/Collector are completed (Year 0), additional enhancements are implemented within the MUNIS system. Additional training is also provided.
- Enhancements are made to the Permit Tracking system and new mobile computers are leased to allow Building Inspectors and others to utilize the software in the field.
- To promote additional capabilities from the field, the Town will develop a Wireless Communications Strategy. This evaluation will help to identify the best way to implement broader wireless capabilities for field use for various software products.
- Security of Town information is extremely important. As such, the Town hires an outside independent consultant to perform an internal and external security assessment.
- Due to new federal guidelines, the Town initiates the development of an eDiscovery plan. This plan outlines the electronic data retention policies for the Town and highlights the steps the Town will take if required to secure and protect information related to a legal case.
- Additional training programs will be introduced to Town employees, which will provide Windows and MS-Office training to users. Appropriate training will also be provided to users as additional capabilities are introduced within the MUNIS software (i.e., purchase order requisition, electronic budgeting). Technical training will be provided to the IT personnel.
- The Department of Public Works obtains additional training on the PavementView software.
- The Fire Department receives additional training on their Fire Management software solution.

- The Law Department obtains additional training on their current software solution, “Time Matters”. New management reports are created to better utilize the information captured within the system.
- Based on the Web-Site Strategy, the Town continues to enhance its web site. Over the next several years, the Town enhances the Greenwich web site to provide a “Virtual Town Hall”, consolidating and enhancing the services of the various web sites maintained by the Town.

Year Two (Fiscal Year 2009 - 2010)

The Digital Imaging and Archiving solution has been fully implemented within the Town of Greenwich. As part of Year Two (2), the following initiatives will be implemented.

- After the Wireless Communication strategy is developed, the Town implements the respective hardware/software to provide for wireless capabilities throughout the Town.
- The Town’s Intranet capabilities are enhanced, providing a broader range of internal services to Town personnel.
- The Town of Greenwich continues to enhance their current Website.
- New MUNIS software modules are implemented through the ASP model (i.e., Bid Management, Work Order, Pension) and integrated into the current enterprise-wide solution. These modules provide various departments with additional required functionality.
- On-going MUNIS training is provided to users on the various aspects of the MUNIS modules.
- Following the GIS plan, the GIS Coordinator and GIS User Group continue to enhance the GIS system and add new layers.
- Additional GIS training is provided to other key users of the GIS system.
- New software is purchased for the Department of Public Works (i.e., Drainage and Civil Storm).
- Additional mobile computers are leased to take advantage of utilizing the permit tracking software in the field.
- A reverse E-911 software solution is purchased to help enhance the emergency preparedness of the Town.
- New MUNIS reporting capabilities are introduced. This allows users to have better access to information within the MUNIS software modules.
- A software selection project is performed to evaluate the Health Department’s Case Management needs and requirements.
- A software selection project is performed to evaluate the Health Department’s Laboratory Information Management needs and requirements.

- In order to enhance efficiency, the Law Department “pilots” using voice recognition software to help with the development of legal documents.
- Utilizing the Town’s GIS, the Police Department implements the HTE Public Safety system interface for the ESRI GIS system. Police are able to track incidents by location and view trends by different incident types.

Year Three (Fiscal Year 2010 - 2011)

The Town continues to expand its outreach to residents and provides additional services through their website. Residents will have the ability to obtain more detailed information from various Town departments, programs and issues via the website. Tasks performed during this Year include:

- On-going MS-Office and MUNIS training is provided to users.
- The Town continues to expand field operations and leases additional mobile computers.
- The Fire Department introduces Mobile Data Terminals (MDT’s) technologies within their fire vehicles.
- New Case Management and Laboratory Management software solutions are introduced within the Health Department.
- Additional software capabilities are added to the MDI system. Clinical and Scheduling modules are implemented within Nathaniel Wetherell.
- The Town hires an independent consultant to evaluate and perform a Disaster Recovery/Business Continuity Plan.

Strategic Technology Plan
Proposed Costs By Year
As of September 2007 - Version 6.0

Annual Cost	Year 0			Year 1			Year 2			Year 3		
	Unit	Unit Price	Total Price									
- Advanced MS-Word Course	3	\$ 600	\$ 1,500	3	\$ 600	\$ 1,500	3	\$ 600	\$ 1,500	3	\$ 600	\$ 1,500
- Introduction to MS-Excel Course	10	\$ 600	\$ 6,000	10	\$ 600	\$ 6,000	10	\$ 600	\$ 6,000	10	\$ 600	\$ 6,000
- Intermediate MS-Excel Course	5	\$ 600	\$ 3,000	5	\$ 600	\$ 3,000	5	\$ 600	\$ 3,000	5	\$ 600	\$ 3,000
- Advanced MS-Excel Course-	3	\$ 600	\$ 1,500	3	\$ 600	\$ 1,500	3	\$ 600	\$ 1,500	3	\$ 600	\$ 1,500
MUNIS Training	5	\$ 1,200	\$ 6,000	5	\$ 1,200	\$ 6,000	5	\$ 1,200	\$ 6,000	5	\$ 1,200	\$ 6,000
-Requisition/Purchase Order Training	5	\$ 1,200	\$ 6,000	5	\$ 1,200	\$ 6,000	5	\$ 1,200	\$ 6,000	5	\$ 1,200	\$ 6,000
-Budgeting Training	5	\$ 1,200	\$ 6,000	5	\$ 1,200	\$ 6,000	5	\$ 1,200	\$ 6,000	5	\$ 1,200	\$ 6,000
-Crystal Reports	5	\$ 1,200	\$ 6,000	5	\$ 1,200	\$ 6,000	5	\$ 1,200	\$ 6,000	5	\$ 1,200	\$ 6,000
-Update MUNIS Training Manuals	1	\$ 10,000	\$ 10,000	1	\$ 5,000	\$ 5,000	1	\$ 5,000	\$ 5,000	1	\$ 5,000	\$ 5,000
IT Technology Training												
- GIS General	6	\$ 600	\$ 3,600	6	\$ 600	\$ 3,600	6	\$ 600	\$ 3,600	6	\$ 600	\$ 3,600
- GIS Technical	2	\$ 2,500	\$ 5,000	2	\$ 2,500	\$ 5,000	2	\$ 2,500	\$ 5,000	2	\$ 2,500	\$ 5,000
- Network/Operating System	2	\$ 2,500	\$ 5,000	2	\$ 2,500	\$ 5,000	2	\$ 2,500	\$ 5,000	2	\$ 2,500	\$ 5,000
- IDS/Security	2	\$ 2,500	\$ 5,000	2	\$ 2,500	\$ 5,000	2	\$ 2,500	\$ 5,000	2	\$ 2,500	\$ 5,000
- Other	2	\$ 2,500	\$ 5,000	2	\$ 2,500	\$ 5,000	2	\$ 2,500	\$ 5,000	2	\$ 2,500	\$ 5,000
Upgrade Town of Greenwich Web-site Web-site Development							1	\$ 20,000	\$ 20,000	1	\$ 20,000	\$ 20,000
3. Commission on Aging Provide OnLine Registration to Programs/Sessions Via Website				1	\$ 5,000	\$ 5,000						
3. Community Development												
4. Conservation Commission												
5. Department of Public Works												
Upgrade Some PCs With DVD Capabilities ✓							5	\$ 500	\$ 2,500	5	\$ 500	\$ 2,500
Lease Mobile PC Technology for Remote Access (Units for Building Inspectors Within IT Department) ✓							15	\$ 1,000	\$ 15,000	20	\$ 1,000	\$ 20,000
Lease Digital Cameras ✓							5	\$ 100	\$ 500	5	\$ 100	\$ 500
Lease Additional Color Printers ✓							3	\$ 500	\$ 1,500	3	\$ 500	\$ 1,500
Lease Additional Printers ✓							2	\$ 500	\$ 1,000	2	\$ 500	\$ 1,000
Consider Implementing MUNIS Work Order Module												
Lease Work Order Module ✓							1	\$ 96,648	\$ 96,648	1	\$ 96,648	\$ 96,648
Work Order Module Training							10	\$ 1,200	\$ 12,000			
Work Order Module Consulting							3	\$ 1,200	\$ 3,600			
Purchase Drainage Software							1	\$ 2,500	\$ 2,500			
Software Maintenance-20% ✓							1	\$ 500	\$ 500	1	\$ 500	\$ 500
Purchase Civil Storm Software										1	\$ 2,500	\$ 2,500
Software Maintenance-20% ✓										1	\$ 500	\$ 500
Provide Additional Training on PavementView Software ✓				2	\$ 1,500	\$ 3,000						
4. Emergency Preparedness												
Purchase and Implement Reverse 911 System							1	\$ 50,000	\$ 50,000			
Software Maintenance ✓							1	\$ 10,000	\$ 10,000	1	\$ 10,000	\$ 10,000
Lease Hardware ✓							1	\$ 2,000	\$ 2,000	1	\$ 500	\$ 500
6. Office of Comptroller												
MUNIS Software Lease												
MUNIS Software Maintenance (current modules) ✓	1	\$ 484,500	\$ 484,500	1	\$ 484,500	\$ 484,500	1	\$ 484,500	\$ 484,500	1	\$ 484,500	\$ 484,500

Strategic Technology Plan
Proposed Costs By Year
As of September 2007 - Version 6.0

Annual Cost	Year 0			Year 1			Year 2			Year 3		
	Unit	Unit Price	Total Price									
✓							1	\$ 35,305	\$ 35,305	1	\$ 35,305	\$ 35,305
							9	\$ 1,200	\$ 10,800			
							3	\$ 1,200	\$ 3,600			
✓							1	\$ 100,000	\$ 100,000	1	\$ 100,000	\$ 100,000
							10	\$ 1,200	\$ 12,000			
							5	\$ 1,200	\$ 6,000			
7. Fire Department												
Implement Fire Management Software												
Provide Additional Fire Management Software Training				5	\$ 1,500	\$ 7,500						
Lease Mobile PC/MDT Technology for Remote Access	✓						10	\$ 1,000	\$ 10,000	10	\$ 1,000	\$ 10,000
8. Fleet												
9. Health												
Enhance Health Website - complete forms online, better content/format							1	\$ 10,000	\$ 10,000	1	\$ 10,000	\$ 10,000
Implement Case Management System												
Software Selection Project							1	\$ 50,000	\$ 50,000			
Purchase Case Management Software System										1	\$ 60,000	\$ 60,000
Provide Software Consulting and Training										1	\$ 15,000	\$ 15,000
Lease Server Hardware for Digital Imaging System	✓									1	\$ 2,000	\$ 2,000
Case Management Software Maintenance	✓									1	\$ 12,000	\$ 12,000
Data Conversion										1	\$ 10,000	\$ 10,000
Implement Laboratory Information Management System												
Software Selection Project							1	\$ 45,000	\$ 45,000			
Purchase Laboratory Information Management Software System										1	\$ 50,000	\$ 50,000
Provide Software Consulting and Training										1	\$ 15,000	\$ 15,000
Lease Server Hardware for Digital Imaging System	✓									1	\$ 2,000	\$ 2,000
Laboratory Management Software Maintenance	✓									1	\$ 10,000	\$ 10,000
10. Human Resources												
Automate Time & Attendance												
-Implement MUNIS modules - Training							1	\$ 10,000	\$ 10,000			
Automate HR Functions												
Obtain MUNIS training and Configure Module(s)				10	\$ 1,200	\$ 12,000						
11. Inland Wetlands												
Implementation of Permit Tracking System (Costs identified through IT Department)												
12. Law												
Improve Utilization of Time Matters Software												
Additional Time Matters Software Training				3	\$ 1,500	\$ 4,500	3	\$ 1,500	\$ 4,500			
Develop Time Matter Software Reports (10 reports)				10	\$ 350	\$ 3,500						
Implement Voice Recognition Capabilities												
Purchase Dragon/Via Voice-legal version							2	\$ 1,200	\$ 2,400	4	\$ 1,200	\$ 4,800
Provide Implementation and Training							2	\$ 1,500	\$ 3,000			
Software Maintenance	✓						2	\$ 480	\$ 960	6	\$ 480	\$ 2,880
Upgrade PC's to Mobile units	✓						2	\$ 1,000	\$ 2,000	2	\$ 1,000	\$ 2,000
13. Nathaniel Withereil												
Implementation of New Patient Information System (MDI)												
Implementation of Clinical Module												
Purchase Clinical Module										1	\$ 80,000	\$ 80,000
Provide Implementation and Training										5	\$ 1,500	\$ 7,500
Software Maintenance	✓									1	\$ 16,000	\$ 16,000

Strategic Technology Plan
Proposed Costs By Year
As of September 2007 - Version 6.0

	Annual Cost	Year 0			Year 1			Year 2			Year 3		
		Unit	Unit Price	Total Price									
Implementation of Scheduling Module													
Purchase Scheduling Module											1	\$ 50,000	\$ 50,000
Provide Implementation and Training											3	\$ 1,500	\$ 4,500
Software Maintenance	✓										1	\$ 10,000	\$ 10,000
14. Park & Recreation													
Purchase Additional Rec-Trac Training								5	\$ 1,500	\$ 7,500	3	\$ 1,500	\$ 4,500
Implement Wireless Mobile Computers	✓										10	\$ 1,000	\$ 10,000
Enhance Website Capabilities											1	\$ 5,000	\$ 5,000
15. Planning & Zoning													
Implementation of Permit Tracking System (Costs identified through IT Department)													
Purchase Additional Mobile Units	✓										10	\$ 1,000	\$ 10,000
16. Police													
Lease/Upgrade Standards Computers	✓							50	\$ 500	\$ 25,000	80	\$ 500	\$ 40,000
Implement Integration Software with GIS and HTE								1	\$ 15,000	\$ 15,000			
Purchase ESRI -HTE software interface								1	\$ 2,400	\$ 2,400			
Migration services(Data Conversion, Installation, Consulting)													
Disaster Recovery Plan											1	\$ 60,000	\$ 60,000
17. Purchasing													
Lease High-Speed Scanner	✓							1	\$ 500	\$ 500	1	\$ 500	\$ 500
Lease Additional Printer	✓							1	\$ 500	\$ 500	1	\$ 500	\$ 500
18. Registrar of Voters													
IT Department To Provide Connectivity to Converse System													
19. Selectman's Office													
20. Social Services													
Lease PDA's	✓							2	\$ 100	\$ 200	2	\$ 100	\$ 200
Purchase Software (Visio & Publisher0								2	\$ 500	\$ 1,000			
21. Tax Collector													
MUNIS Training		2	\$ 1,200	\$ 2,400	3	\$ 1,200	\$ 3,600	3	\$ 1,200	\$ 3,600			
22. Town Clerk													
Land Records Management System													
-Digital Imaging Solution Should Provide for this													
Year Totals:			\$ 3,690,200			\$ 3,341,000			\$ 3,881,963			\$ 3,558,783	

Assumptions

- A 1. Our assumptions above assume costs on a full fiscal year
- A 2. Personal computer lease costs are based on a standard minimum configuration
- A 3. PCs and Servers are leased
- A 4. All PCs are configured with Microsoft Office and Virus Protection software licenses
- A 5. Used 20% of Original Purchase Price for Software maintenance Expense
- A 6. A single training class is limited to 10 people. Class duration is 4 hours
- A 7. Business Objects/Cyrstal Report Writer must be purchased (one time charge) and self hosted on a Greenwich server.
- A 8. Three levels of training classes will provide more flexibility in topics covered in class

VI. Conclusion

VI. Conclusion

The objective of this plan is to provide the Town of Greenwich with a unified “roadmap” for implementing technology. The concepts and ideas presented in this plan are designed to address the needs and requirements of the Town’s personnel and improve the processes currently impacting business operations.

Overall the plan addresses a myriad of issues in several ways. This includes:

- Developing a single, flexible technology foundation that incorporates the strategic directions of the Town, Greenwich Public Library and Public School systems. The end result is a unified plan that allows all groups to leverage the costs and advantages of technology to achieve their combined and individual goals.
- Implementing applications and procedures that make information easier to use and more accessible.
- Utilizing a phased implementation approach for technologies based on departmental needs and adopted departmental budgets. Requirements can be assessed and evaluated thoroughly, costs will be better managed, and users can become adequately trained.
- Implement appropriate policies and guidelines to ensure all users understand the intended use of new technologies and the consequences for misuse.
- Acquire the necessary knowledge resources to help direct and manage the implementation and use of key systems, such as the Permitting, Digital Imaging and GIS applications.
- Emphasize the concept of system “ownership” at the departmental level to ensure appropriate use of IT Department resources and the recognition of responsibility and accountability for the successful use of all technology investments.
- Provide continual, incremental training to ensure both users and IT support staff obtain and maintain the skill sets necessary to use the software tools effectively.

It will be critical for the Town to monitor the progress of this plan on a regular basis. The User Groups should constantly evaluate the plan to ensure stated projects are kept on track financially and kept to specific deadlines. The IT Department should be given the task of revisiting the direction of the plan periodically to ensure it remains in line with the evolving expectations of the Town, constantly evaluating how technology tools can provide enhanced service and communications to residents.

VII. Appendix

VII.A Acknowledgments

This project relied heavily on information that could only be obtained from the employees of the Town of Greenwich. Our challenge was to accumulate key information and as many viewpoints in a compressed amount of time. A lot of information and Town viewpoints were identified through focus group sessions.

Focus Groups – Forty-Seven focus groups, consisting of representatives from all Town departments, Public Library and Board of Education personnel were conducted. These two hour sessions gave employees from all aspects of the Town’s government the opportunity to share ideas and identify specific needs relevant to the use of technology in their departments. The groups were developed along departmental lines in order to concentrate on common processes shared between and among departments. The focus groups are identified in section I.

Focus group members were asked to consider the following four questions:

1. What information is currently gathered, processed and/or produced within your department/functional area?
2. What are the business problems/obstacles currently experienced by your department/functional area?
3. How do these problems affect the flow of information through your department and your ability to deliver service?
4. What technological changes would you make to improve the flow and manipulation of data through your department?

The responses to these questions were evaluated for common themes and specific issues that show how data is processed within and between the Town’s departments.

On the following pages we have identified the focus groups and key contacts of each group. In most instances, multiple members of each department participated in this project.

We wish to thank all who participated for their time, knowledge and efforts.

<u>Item</u>	<u>Department</u>	<u>Name</u>	<u>Title</u>
1.	Commission on Aging	Samuel Deibler	Director
2.	School District	Sue Wallerstein	Director
3.	Town Clerk	Carmella Budkins	Town Clerk
4.	Community Development	Nancy Brown	Director
5.	Emergency Preparedness	Dan Warzoha	Coordinator
6.	Accounts Payable	Roy Carey	AP Supervisor
7.	Finance/Accounting Administration	Peter Mynarski	Comptroller
8.	Finance/Accounting Administration	Roland Gieger	Budget & Systems Director
9.	Retirement	Jim Lavin	Retirement Plans Administrator
10.	Treasury	Kathleen Murphy	Treasurer
11.	Fire Department	Sanford Anderson	Fire Chief
12.	Fleet Department	Betty Linck Stephanie	Fleet Director
13.	Community Health Planning	Paulmeno	Director
14.	Environmental Health	Michael Long	Director
15.	Family Health	Deborah Travers	Acting Director
16.	Health Department	Caroline Baisley	Director
17.	Laboratory	Douglas Serafin	Director
18.	Employee Benefits	Sherry Krieger	Employee Benefits
19.	Human Resources	Maureen Kast	Director Of Human Resources
20.	Payroll	Tori Walker	Payroll System Administrator
21.	Information Technology	Boris Hutorin	Director Of Information Technology
22.	Conservation	Denise Savageau	Director
23.	Inland Wetlands	Mark Massoud	Director
24.	Planning & Zoning	Diane Fox	Town Planner
25.	Law Department	John Wayne Fox	Town Attorney
26.	Greenwich Library	Mario Gonzalez William	Director
27.	Nathaniel Witherell	Kowalewski	Executive Director
28.	Parking Services Marine & Facility Operations	Allen Corry	Director
29.	Division	Fred Walters	Superintendent

<u>Item</u>	<u>Department</u>	<u>Name</u>	<u>Title</u>
30.	Parks & Recreation Department	Joseph Siciliano	Director
31.	Parks & Recreation Department	Thomas Greco	Manager
32.	Parks & Trees Division	Bruce Spaman	Superintendent
33.	Recreation Division	Peter Mandras	Superintendent
34.	Police	James Walters	Chief Purchasing & Adm. Services
35.	Purchasing	Joan Sullivan	Director
36.	Building Inspection	Bill Marr	Building Official
37.	Engineering	David Thompson	Chief Engineer
38.	Highway	Joseph Roberto	Superintendent
39.	Public Works Department	Lloyd Hubbs	Commissioner
40.	Sewer	Amy Siebert	Superintendent
41.	Traffic	Garo Garabedian	Traffic Engineer
42.	Selectmen's Office	Edward Gomeau	Town Administrator
43.	Social Services	Victoria Anyikwa	Acting Commissioner
44.	Assessor's Office	Ted Gwartney	Assessor
45.	Tax Collector	Lou Caravella	Tax Collector
46.	Voter Registration	Sharon Vecchiola	Democratic Party
47.	Voter Registration	Veronica Musca	Republican Party

VII.B Definition of Terms

100Base-T:	<p>One of several adaptations of the Ethernet (IEEE 802.3) standard for Local Area Networks (LANs). The 100Base-T standard (also called <i>Twisted Pair Ethernet</i>) uses a twisted-pair cable with maximum lengths of 100 meters.</p> <p>Cables in the 10Base-T system connect with RJ-45 connectors. A star topology is common with 12 or more computers connected directly to a hub or concentrator. The 100Base-T system operates at 100 megabits per second (Mbps) using baseband transmission methods.</p>
3GL Third-generation language:	<p>A language such as C, COBOL, FORTRAN or Pascal that provides developers with considerable flexibility at the cost of ease of use. Most 3GLs can handle such detailed tasks as detailed memory manipulation and physical disk access, which most 4GLs cannot handle. 3GLs, however, are complex and require more development time for applications.</p>
4GL Fourth generation language:	<p>A high-level language usually built using a 3GL. 4GLs, which are easier to use than 3GLs, are generally preferable for creating database applications and for use with popular development tools.</p>
ActiveX:	<p>A technology from Microsoft that links desktop applications to the World Wide Web. Using ActiveX tools, software developers can create interactive Web content for their applications. For example, Word and Excel documents can be viewed directly in a browser if ActiveX is enabled.</p>
ADSL:	<p>ADSL (Asymmetric Digital Subscriber Line) is a technology for transmitting digital information at high bandwidths on existing phone lines to homes and businesses. ADSL is asymmetric in that it uses most of the channel to transmit downstream to the user and only a small part to receive information from the user. ADSL simultaneously accommodates analog (voice) information on the same line. ADSL is generally offered at downstream data rates from 512 Kbps to about 6 Mbps. ADSL was specifically designed to exploit the one-way nature of most multimedia communication in which large amounts of information flow toward the user and only a small amount of interactive control information is returned. ADSL and other forms of DSL are expected to become more widely available in 1999 and 2000. With ADSL (and other forms of DSL), telephone companies are competing with cable companies and their cable modem services.</p>
Application Service Provider (ASP):	<p>An ASP is a company providing computer based services over a network of users. ASP services are used as an alternative to the use of in-house processes or applications. ASPs are commonly used by companies to gain access to specialized and costly applications, as well as outside networks.</p>
ATM:	<p>Short for <i>Asynchronous Transfer Mode</i>, a network technology based on transferring</p>

data in *cells* or *packets* of a fixed size. The cell used with ATM is relatively small compared to units used with older technologies. The small, constant cell size allows ATM equipment to transmit video, audio and computer data over the same network and assure that no single type of data hogs the line.

Current implementations of ATM support data transfer rates of from 25 to 622 Mbps (megabits per second). This compares to a maximum of 100 Mbps for Ethernet, the current technology used for most LANs.

Bandwidth: The amount of data that can be sent through a network connection, measured in bits per second (bps). High bandwidth allows fast transmission or high-volume transmission.

Broadband: This term refers to high-speed data transmission in which a single cable can carry several channels of data at once. The most common type of broadband transmission is cable wiring (as in cable TV and cable modems). Because of its multiple channel capability, broadband has started to replace the baseband, or single-channel technology most computer networks were originally based on.

Internet Browser: A software program that facilitates easy, graphical browsing of the World Wide Web. Several browsers are currently available, the most popular being AOL/Netscape's Communicator and Microsoft's Internet Explorer. Browsers have fairly limited capabilities and rely on "plug-in" programs to perform most complex tasks. For this reason, browsers are easily suited as the common front-ends for Intranets.

Business Continuity: Continuity concerns measures that an organization takes to ensure minimal hindrance to operations in the event that something detrimental occurs. Business continuity is the general term used to describe the prevention of interruption of core business activities and the prompt correction of functions affected by any type of crisis. Continuity planning involves such things as proper budget allocation, backup operational mechanisms, and data duplication. A Disaster Recovery Plan (see below) is an example of one component of a Business Continuity Plan.

Cable Modem: Though a cable modem serves the same purpose as a typical analog modem, a cable modem is different in many ways. The biggest difference is that a cable modem is much faster. While a 56K modem can receive data at about 53 Kbps, a cable modem can haul it in at about 1.5 Mbps. That's about 30 times faster. Though the actual Internet bandwidth over a cable TV line is up to 27 Mbps for downstream to the subscriber and about 2.5 Mbps upstream, since the local provider may only have a T1 connection, which maxes out at 1.5 Mbps, that will be the maximum transfer rate for the subscriber. Also, a cable modem doesn't hook up to a phone line; it connects to a local cable TV line, hence the term "cable modem". This allows computers equipped with a cable modem to have a continuous connection to the Internet.

Cable modems, which have a much more complex design than telephone modems are

usually external devices, but they can be integrated within a computer or set-top box. Finally, instead of connecting to a serial port, cable modems attach to a standard Ethernet card so that they can transfer data at the fastest speed possible.

The way the cable modem system works is pretty complex. All cable modems are attached to a coaxial cable line owned by some cable TV company where they connect to the company's Cable Modem Termination System (CMTS). Cable modems connected to the main line can receive from and send signals only to the CMTS, not to other cable modems on the line. In some cases, upstream signals are returned by telephone rather than the cable line, in which case the cable modem is known as a telco-return cable modem.

- Computer Aided Design (CAD):** Also known by engineers and architects as the best invention of all time. Today, CAD software is used for pretty much all three-dimensional designing. It is much easier and quicker to turn an object into an electronic representation than to diagram one with a pencil and paper. Better yet, objects created with CAD are very accurate and can be changed instantly.
- Client:** The client part of a *client-server architecture*. Typically, a client is an application that runs on a personal computer or workstation and relies on a server to perform some operations. For example, an *e-mail client* is an application that enables you to send and receive e-mail.
- Clock speed:** Also called *clock rate*, the speed at which a microprocessor executes instructions. Every computer contains an internal clock that regulates the rate at which instructions are executed and synchronizes all the various computer components. The CPU requires a fixed number of clock ticks (or *clock cycles*) to execute each instruction. For example, an Intel 80286 microprocessor needs about 20 clock cycles to multiply two numbers together. The faster the clock, the more instructions the CPU can execute per second.
- Concentrator:** A type of multiplexor that combines multiple channels onto a single transmission medium in such a way that all individual channels can be simultaneously active. For example, Internet Service Providers use concentrators to combine their dial-up modem connections onto faster T-1 lines that connect to the Internet.
- Concentrators are also used in local-area networks (LANs) to combine transmissions from a cluster of nodes. In this case, the concentrator is often called a *hub*.
- Cookie:** A cookie is data sent to your computer by a web server that records your actions on a certain web site. It's a lot like a preference file for a program on your computer. Whenever you visit the site after being sent the cookie, the site will load according to the information stored in the cookie. For example, some sites can remember information like your user name and password, so you don't have to re-enter it each time you visit the site. Cookies are what allow you to have personalized web sites

like "My Excite" or "My Yahoo" in which you can customize what is displayed on the page.

- Database server:** A system that receives requests from client applications over a network and responds by returning requested data (the answer set). Each database server is made up of a computer, an operating system and database server software.
- Disaster Recovery Plan:** A plan for “business continuity” (see above) in the event of a disaster that may destroy a company’s physical and technological resources. The goal of a disaster recovery plan is to regain access to equipment and data, and to resume business operations as quickly as possible. A DRP usually includes elements of risk assessment, disaster prevention, and recovery strategy in the event of a disaster. A DRP also entails the understanding of the organization’s activities and vulnerabilities, in order to better prepare for and assess the consequences of a disaster.
- Dynamic Link Library (DLL):** A .dll file contains a library of functions and other information that can be accessed by a Windows program. When the program is launched, a link to the .dll file is created. If a static link is created, the .dll file will be in use as long as the program is active. If a dynamic link is created, the .dll file will only be used when needed. Because of this, .dll files allow programs to use resources, such as memory and hard drive space, more efficiently.
- Domain Name:** This is the name that identifies a web site. For example, "apple.com" is the domain name of Apple Computer's web site. A single web server may have more than one domain name, but a single domain name points to only one machine. To use Apple Computer as an example again, www.apple.com, support.apple.com, and store.apple.com could be served on one to three machines. It is also possible, and quite common, for a domain name to be registered, but not be connected to an actual machine. The reason for this is usually so that a company or group can have e-mail addresses at a certain domain without having to maintain a web site. In these cases, there still must be a machine to handle the mail of the listed domain name.
- DoS (Denial of Service):** A form of attack on (usually) an internet service, which aims to prevent the service from operating properly, often by bombarding it with more information than it can process.
- Downloading:** This is the process in which data is sent to your computer. Whenever you get information off the Internet, you are downloading it to your computer. For example, you might have to download an upgrade for your computer's operating system in order to play a new game (especially if you're using Windows). The opposite of this process, sending information to another computer, is called uploading.
- Driver:** A driver is a small file that helps the computer communicate with a certain hardware device. It contains information needed to recognize and control the device which the

computer does not already have. In Windows-based PCs, a driver is often packaged as a dynamic link library (DLL) file; in Macs, most hardware devices don't need drivers, but the ones that do usually come with a software driver in the form of a System Extension.

DSL: DSL (Digital Subscriber Line) is a technology for bringing high-bandwidth information to homes and small businesses over ordinary copper telephone lines. Typical individual connections will provide from 1.544 Mbps to 512 Kbps downstream and about 128 Kbps upstream. A DSL line can carry both data and voice signals and the data part of the line is continuously connected. Within a few years, DSL is expected to replace ISDN in many areas and to compete with the cable modem in bringing multimedia and 3-D to homes and small businesses.

Digital Versatile Disk (DVD): A DVD is a high-capacity optical disc that looks like a CD, but can store much more information. While a CD can store 650 MB of data, a single-layer, single-sided DVD can store 4.7GB of data. This allows for massive computer applications and full-length movies to be stored on a single DVD

E-Commerce: E-commerce refers to business over the Internet. Web sites such as Amazon.com, LandsEnd.com, and eBay are all e-commerce sites. The two major forms of e-commerce are Business-to-Consumer (B2C) and Business-to-Business (B2B). While companies like Amazon.com cater mostly to consumers, other companies provide goods and services exclusively to other businesses. The terms "e-business" and "e-tailing" are often used synonymously with e-commerce.

E-mail: Short for *electronic mail*, the transmission of messages over communications networks. The messages can be notes entered from the keyboard or electronic files stored on disk. Most mainframes, minicomputers and computer networks have an e-mail system. Some electronic-mail systems are confined to a single computer system or network, but others have gateways to other computer systems, enabling users to send electronic mail anywhere in the world. Companies that are fully computerized make extensive use of e-mail because it is fast, flexible and reliable.

Sent messages are stored in electronic mailboxes until the recipient fetches them. To see if you have any mail, you may have to check your electronic mailbox periodically, although many systems alert you when mail is received. After reading your mail, you can store it in a text file, forward it to other users or delete it. Copies of memos can be printed out on a printer if you want a paper copy.

All on-line services and Internet Service Providers (ISPs) offer e-mail, and most also support gateways so that you can exchange mail with users of other systems. Usually, it takes only a few seconds or minutes for mail to arrive at its destination. This is a particularly effective way to communicate with a group because you can broadcast a message or document to everyone in the group at once.

- Extranet:** An Intranet that is partially accessible to authorized outsiders. Whereas an Intranet resides behind a firewall and is accessible only to people who are members of the same company or organization, an Extranet provides various levels of accessibility to outsiders. Typically, an Extranet can be accessed only if you have a valid username and password, and your identity determines which parts of the Extranet you can view.
- Fiber-Optic Cable:** This is a cable made up of super-thin filaments of glass or other transparent materials that can carry beams of light. Using a laser transmitter that encodes frequency signals into pulses of light, data can be sent through these cables at the speed of light. The receiving end of the transmission translates the light signals back into frequencies which can be read by a computer. Because fiber-optics are based entirely on beams of light, they are less susceptible to noise and interference than other data-transfer mediums.
- However, the cables are fragile and are usually placed underground, which makes them difficult and expensive to install. Some fiber-optic cables are installed above ground, but if they break too many times, they need to be completely replaced, which is not cheap. The reason they need to be replaced is because breaks in the cables can only be fixed a few times, whereas copper wires can be spliced as many times as needed.
- Firewall:** A system designed to prevent unauthorized access to or from a private network. Firewalls can be implemented in both hardware and software or a combination of both. Firewalls are frequently used to prevent unauthorized Internet users from accessing private networks connected to the Internet, especially *intranets*. All messages entering or leaving the intranet pass through the firewall, which examines each message and blocks those that do not meet the specified security criteria.
- A firewall is considered a first line of defense in protecting private information. For greater security, data can be encrypted.
- Flame:** A strong and inflammatory message delivered by E-mail or public posting on an electronic bulletin board.
- Frame Relay:** A packet-switching protocol for connecting devices on a Wide Area Network (WAN). Frame Relay networks support data rates up to 1.544 Mbps (1.5 billion bits per second). Most telephone companies now provide Frame Relay service for customers who want connections at T1 speeds.
- FTP (File Transfer Protocol):** The original and most popular way to transfer files over the Internet. Networks that allow “anonymous FTP” enable anyone to log on to a system and retrieve files, while other FTP systems require that the user enter a password.

- Gigabyte:** A gigabyte consists of roughly 1 billion bytes. To be exact, there are 1024 megabytes or 1,073,741,824 bytes in a gigabyte, but no one really cares. Because of the large size of today's hard disks, storage capacity is usually measured in gigabytes. Abbreviation: "GB".
- GIGO:** Stands for "Garbage In, Garbage Out," (not for Gigobyte, considering the word is Gigabyte). It basically means that if invalid data is entered in a computer program, the resulting output will also be invalid. So if a program asked for a character and you decided to be funny and enter "3.14159", there's a good chance the results you get back would be pretty messed up, or "garbage". Because people aren't always smart enough to enter valid data, programmers have to take excessive measures to protect their programs from GIGO-type errors.
- Graphical User Interface (GUI):** A pictorial or icon based method intended to assist people in their use of personal computers. Prior to the advent of Microsoft's Windows, users typed in program commands at a simple system prompt (i.e., C:\>). This method, or interface, required users to remember a great many specific instructions that were often less than easy to understand. The graphical user interface, introduced by the Apple Computer company, eliminates the need to remember commands by combining the use of icons and a "mouse" to start and run a computer program. This interface has gained wide acceptance through MS-Windows.
- HTML:** Stands for "Hyper-Text Markup Language." Today's software programs are created mostly in C/C++; today's web pages are created in HTML. Also known as hypertext documents, web pages must conform to the rules of the HTML language in order to be displayed correctly in a web browser. The HTML syntax is based on a list of tags that describe the format and what is displayed on web pages. Fortunately, the HTML language is quite easy to learn. Even more fortunately, (so much for good grammar), most web page development programs allow you to create web pages via a graphical interface without having to actually write the HTML code.
- HTTP:** Stands for "HyperText Transfer Protocol." It is the protocol used to transfer data over the World Wide Web. That's why all web site addresses begin with "http://". Whenever you type a URL into your browser and hit Enter, your computer sends an HTTP request to a Web server. The Web server then sends to you the requested HTML page.
- Internet:** A global web connecting more than a million computers. Currently the Internet has more than 30 million users worldwide, and that number is growing rapidly. More than 100 countries are linked into exchanges of data, news and opinions.
- Unlike on-line services, which are centrally controlled, the Internet is decentralized by design. Each Internet computer, called a host, is independent. Its operators can choose from Internet services to provide to its local users and which local services to make available to the global Internet community. Remarkably, this anarchy by

design works exceedingly well.

There are a variety of ways to access the Internet. Most on-line services, such as CompuServe and America On-line, offer access to some Internet services. It is also possible to gain access through a commercial Internet Service Provider (ISP).

Internetworking:

The art and science of connecting individual local-area networks (LANs) to create wide-area networks (WANs), and connecting WANs to form even larger WANs. Internetworking can be extremely complex because it generally involves connecting networks that use different protocols. Internetworking is accomplished with routers, bridges and gateways.

Intranet:

A web site or group of Web sites belonging to an organization, usually a corporation, accessible only by the organization's members, employees or others with authorization. An Internet's Web sites look and act just like any other Web sites, but the *firewall* surrounding an intranet fends off unauthorized access.

Like the Internet itself, intranets are used to share information. Secure intranets are now the fastest-growing segment of the Internet because they are much less expensive to build and manage than private networks based on proprietary protocols.

IP address:

A 32-bit number consisting of four octets (sets of eight binary digits) that specifies a network address and a host ID on a TCP/IP network.

KB/MB/GB:

These acronyms are shorthand identifiers for Kilobyte (KB), Megabyte (MB), and Gigabyte (GB). They are used when describing the storage capacities of various computing equipment, such as hard drives and memory. Each term indicates the number of zeros following the stated number, for example 10KB equals 10,000, 10MB equals 10,000,000, etc.

Linux:

Pronounced "lihnuks", this is an operating system similar to Unix, created by Linus Torvalds. His reason for developing it was that he wasn't happy with any of the currently available options. He freely distributed his OS, helping it to gain popularity. Today, Linux is currently used by hundreds of thousands of people around the world. Computer hobbyists love it because it's very customizable and you can actually add your own code to OS itself. However, Linux has also become the choice for some corporations because it is an inexpensive substitute for Unix. The current supported hardware platforms are Intel, PowerPC, DEC Alpha, Sun Sparc, and Motorola.

Listserv:

A listserv, also known as a list server, is a small program that automatically sends messages to e-mail addresses on a mailing list. When someone subscribes to a mailing list, the listserv will automatically add the address and distribute future e-mail postings to that address along with all the others on the list. When someone unsubscribes, the listserv simply removes the address. A common listserv program is

Majordomo, which instructs users to send an e-mail to majordomo@servername.com to subscribe or unsubscribe from a mailing list.

Mailbox: An area in memory or on a storage device where e-mail is placed. In e-mail systems, each user has a private mailbox. When the user receives e-mail, the mail system automatically puts it in the mailbox. The mail system allows you to scan mail that is in your mailbox, copy it to a file, delete it, print it or forward it to another user.

Metropolitan Area Network (MAN): A network connecting computer resources in areas larger than those supported by a Local Area Network (LAN) but smaller than those covered by a Wide Area Network (WAN). MANs are often used as a means of connection of multiple local area networks, and are used by many individuals and organizations across the network.

Modem: Acronym for *modulator-demodulator*. A modem is a device or program that enables a computer to transmit data over telephone lines. Computer information is stored digitally, whereas information transmitted over telephone lines is transmitted in the form of analog waves. A modem converts between these two forms. (Note that ISDN telephone lines send data digitally, so they do not require modems.)

Fortunately, there is one standard interface for connecting external modems to computers called RS-232. Consequently, any external modem can be attached to any computer that has an RS-232 port, which almost all personal computers have. There are also modems that come as an expansion board that you can insert into a vacant expansion slot. These are sometimes called onboard or internal modems and are more machine specific.

Aside from the transmission protocols that they support, the following characteristics distinguish one modem from another:

- **bps:** How fast the modem can transmit and receive data. At slow rates, modems are measured in terms of baud rates. The slowest rate is 300 baud (about 25 cps). At higher speeds, modems are measured in terms of bits per second (bps). The fastest modems run at 56,000 bps, although they can achieve even higher data transfer rates by compressing the data. Obviously, the faster the transmission rate, the faster you can send and receive data. Note, however, that you cannot receive data any faster than it is being sent. If, for example, the device sending data to your computer is sending it at 2,400 bps, you must receive it at 2,400 bps. It does not always pay, therefore, to have a very fast modem. In addition, some telephone lines are unable to transmit data reliably at very high rates.
- **voice/data:** Many modems support a switch to change between voice and data modes. In data mode, the modem acts like a regular telephone. Modems that support a voice/data switch have a built-in loudspeaker and microphone for voice communication.

- data compression: Some modems perform data compression, which enables them to send data at faster rates. However, the modem at the receiving end must be able to decompress the data using the same compression technique.

Network Operating System (NOS):

An operating system that includes special functions for connecting computers and devices into a local-area network (LAN). Some operating systems, such as UNIX, Linux and the Mac OS, have networking functions built in. The term *network operating system*, however, is generally reserved for software that enhances a basic operating system by adding networking features. For example, some popular NOSs include Novell Netware and Microsoft.

Network:

A group of two or more computer systems linked together. There are many types of computer networks, including:

- local-area networks (LANs): The computers are geographically close together (that is, in the same building).
- wide-area networks (WANs): The computers are farther apart and are connected by telephone lines or radio waves.

In addition to these types, the following characteristics are also used to categorize different types of networks:

- topology: The geometric arrangement of a computer system. Common topologies include a bus, star and ring.
- protocol: A protocol defines a common set of rules that computers on a network use to communicate. One of the most popular protocols for LANs is called Ethernet. Another popular LAN protocol for PCs is the IBM token-ring network.
- architecture: Networks can be broadly classified as using either a peer-to-peer or client/server architecture.

Computers on a network are sometimes called nodes. Computers and devices that allocate resources for a network are called servers.

Network-Attached Storage (NAS):

Hard disk storage that connects to the server through its own network address. Because it is not attached to the department server, NAS allows for more hard disk storage space and faster application programming and file serving. A NAS device is specifically designed to handle files and is directly accessible on the Local Area Network (LAN).

Object Linking and Embedding (OLE):

A standard method, defined by Microsoft, for exchanging information between Windows applications. Host applications (known as *containers*) are linked to OLE

objects when they contain references to those objects. An embedded object, by contrast, contains an actual copy of the object.

Open Database Connectivity (ODBC):

A component of the Windows Open Services Architecture (WOSA) that provides multi-database access by adding its own set of programming standards on top of the native database layers, thus simplifying access. The developer need deal with only a single standard to access numerous database servers, because ODBC can translate standard ODBC function calls into many different native database dialects.

Operating System:

The most important program that runs on a computer. Every general-purpose computer must have an operating system to run other programs. Operating systems perform basic tasks, such as recognizing input from the keyboard, sending output to the display screen, keeping track of files and directories on the disk and controlling peripheral devices such as disk drives and printers.

For large systems, the operating system has even greater responsibilities and powers. It is like a traffic cop -- it makes sure that different programs and users running at the same time do not interfere with each other. The operating system is also responsible for security, ensuring that unauthorized users do not access the system.

Operating systems can be classified as follows:

- multi-user: Allows two or more users to run programs at the same time. Some operating systems permit hundreds or even thousands of concurrent users.
- multiprocessing: Supports running a program on more than one CPU.
- multitasking: Allows more than one program to run concurrently.
- multithreading: Allows different parts of a single program to run concurrently.

Operating systems provide a software platform on top of which other programs, called *application programs*, can run. The application programs must be written to run on top of a particular operating system. Your choice of operating system, therefore, determines to a great extent the applications you can run. For PCs, the most popular operating systems is Windows, but others are available, such as Unix.

Personal Digital Assistant (PDA):

A pocket-sized personal computer, PDAs usually can store phone numbers, appointments, and to-do lists. Some PDAs have a small keyboard, others have only a special pen that is used for input and output. A PDA can also have a wireless fax modem. Files can be created on a PDA which are later entered into a larger computer

Relational database

A database application back end that stores information in two-dimensional tables

management system (RDBMS):	linked by common properties. <i>SQL</i> is used to create, manipulate and extract data from relational databases.
RISC:	Pronounced <i>risk</i> , acronym for <i>reduced instruction set computer</i> , a type of microprocessor that recognizes a relatively limited number of instructions. Until the mid-1980s, the tendency among computer manufacturers was to build increasingly complex CPUs that had ever-larger sets of instructions. At that time, however, a number of computer manufacturers decided to reverse this trend by building CPUs capable of executing only a very limited set of instructions. One advantage of reduced instruction set computers is that they can execute their instructions very fast because the instructions are so simple. Another, perhaps more important advantage, is that RISC chips require fewer transistors, which makes them cheaper to design and produce.
Router:	<p>A device that connects two LANs. Routers are similar to bridges, but provide additional functionality, such as the ability to filter messages and forward them to different places based on various criteria.</p> <p>The Internet uses routers extensively to forward information packets from one host to another.</p>
Search Engine:	Search Engines are web sites that maintain databases or indexes of the various web sites that can be found on the Internet. Search engines, such as Yahoo, Excite, Alta Vista, and InfoSeek, allow users to enter specific words, terms or phrases to research a wide variety of topics.
SSL Secure Sockets Layer:	SSL is a transaction security standard developed by Netscape Communications to enable commercial transactions to take place over the Internet. It's one of a few competing security standards.
Server:	<p>A computer or device on a network that manages network resources. For example, a <i>file server</i> is a computer and storage device dedicated to storing files. Any user on the network can store files on the server. A <i>print server</i> is a computer that manages one or more printers, and a <i>network server</i> is a computer that manages network traffic. A <i>database server</i> is a computer system that processes database queries.</p> <p>Servers are often dedicated, meaning that they perform no other tasks besides their server tasks. On multiprocessing operating systems, however, a single computer can execute several programs at once. A server in this case could refer to the program that is managing resources rather than the entire computer.</p>
Storage Area Network (SAN):	A high-speed network that connects multiple data servers with different kinds of data storage devices. A SAN may improve network administration by centralizing storage and treating it a single resource, as opposed to managing multiple servers. SANs support data storage, retrieval and replication, as well as data backup, migration and

sharing among servers in a network.

Structured Query Language (SQL):

A relational data-access language created by IBM. Most relational databases use SQL as a standard way of accessing data from client applications.

T-1:

This is a data transfer system that transfers digital signals at 1.544 megabits per second (a little faster than a 56K modem, which maxes out at around 0.056 mb/sec). The name "T1" was coined by AT&T. Most small to mid-sized colleges and business have T1 lines running out of their buildings. Because of the T1's large bandwidth, hundreds of people can be accessing the Internet from one T1 line with little slowdown. However, like all good things, too many people on one T1 line can still cause dramatic decreases in data transfer speeds. For this reason, multiple T1s are often used.

TCP/IP:

Acronym for *Transport Control Protocol/Internet Protocol*, the suite of communications protocols used to connect hosts on the Internet. TCP/IP uses several protocols, the two main ones being TCP and IP. TCP/IP is built into the UNIX operating system and is used by the Internet, making it the de facto standard for transmitting data over networks. Even network operating systems that have their own protocols, such as Netware, also support TCP/IP.

URL (Universal Resource Locator):

An address used to locate something on the internet, most often a web page. All web addresses are URLs.

USB (Universal Serial Bus):

A new type of serial port (or connector), faster and more versatile than its predecessors. Used to attach extra devices such as a scanner to a PC. Fitted on new PCs from about late 1998.

VPN (Virtual Private Network):

A virtual private network (VPN) is a private data network that makes use of the public telecommunication infrastructure, maintaining privacy through the use of a tunneling protocol and security procedures. A virtual private network can be contrasted with a system of owned or leased lines that can only be used by one company. The idea of the VPN is to give the company the same capabilities at much lower cost by using the shared public infrastructure rather than a private one. Phone companies have provided secure shared resources for voice messages. A virtual private network makes it possible to have the same secure sharing of public resources for data. Companies today are looking at using a private virtual network for both extranets and wide-area intranets.

Virtual Circuits:

Packets are routed through one or more Virtual Circuits known as Data Link Connection Identifiers (DCLIs). Each DLCI has a permanently configured switching path to a certain destination. Thus, by having a system with several DCLIs configured, you can communicate simultaneously with several different sites.

Currently, only permanent virtual circuit connections are supported. This means that all DCLI connections are set up by the network provider at subscription time.

Voice over Internet Protocol (VoIP):

Delivers voice information over the Internet, essentially using it as a global telephone network. Voice information is digitally converted and sent over the Internet. VoIP services that use telephones can usually make and receive phone calls from any regular phone, but software-based require the use of a computer to make and receive calls. VoIP services run through a private network are usually more reliable than those run using public networks. An advantage of using a VoIP service is that it avoids tolls charged by regular phone services.

Webmaster:

The webmaster is the person in charge of maintaining a web site. The jobs of a webmaster range from writing HTML for web pages to organizing the web site's structure to responding to e-mails about the web site.

Wide-Area Network (WAN):

A computer network that spans a relatively large geographical area. Computers connected to wide-area network are connected through telephone lines or radio waves.

Wireless Application Protocol (WAP):

A global standard for developing applications over wireless communication networks

Wireless Communications:

In computer networking, this term refers to networks that are connected by radio rather than by wires. Wireless communications are enabled by packet radio, spread spectrum, cellular technology, satellites, and microwave towers, and can be used for voice, data, video, and images. Sometimes wireless networks can interconnect with regular computer networks.

World Wide Web (also known as WWW or W3):

A system designed at the European Laboratory for Particle Physics in Geneva, Switzerland (CERN) that allows a user to search for related “pages” globally, from simple text to multimedia graphics, just by pointing and clicking with a mouse. Built on the concept of linking different types of information, the WWW is the fastest-growing segment of the Internet and the most useful for commerce.