New York State Office of the State Comptroller

Division of Local Government and School Accountability

LOCAL GOVERNMENT MANAGEMENT GUIDE

Information Technology Governance

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Many local governments and school districts invest a considerable amount of resources in information technology (IT) including computers and related equipment, software, and costs related to Internet access and personnel training. They rely on IT systems for storing important financial and nonfinancial information, accessing the Internet, communicating through email, and reporting to State and federal agencies. These systems and the data they hold are valuable and need to be protected from unauthorized, inappropriate, and wasteful use. Protecting IT assets is especially important as the number of instances of people with malicious intent trying to harm computer networks and/or gain unauthorized access to information through the use of viruses, malware, and other types of attacks continues to rise.

Although no single practice or policy on its own can adequately safeguard your technology investment, there are a number of controls that, if appropriately implemented and monitored, collectively increase the odds that your systems and data will remain safe. Management, including the governing board, is responsible for ensuring that the right IT controls are in place, and that they are performing as intended. Given the rapid pace of technological innovation, the ever increasing sophistication and number of threats facing computer systems and the fact that IT is only one aspect of management's responsibilities, this can be a formidable task.

The following guidance is intended to make the oversight of information technology less daunting by providing a template for understanding and strengthening controls over IT. It includes a Security Self-Assessment, structured around 12 key areas of IT security, that is intended to help you exercise effective oversight of IT operations and serve as a starting point for discussions with personnel who are responsible for the day-to-day management of your computer operations. Since the assessment is geared toward small- to medium-sized computer operations, we limited the number of questions; there are many more questions you could and possibly should ask about your IT internal controls.

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Responsibility for IT Internal Controls

Internal controls over IT seek to ensure that computer systems and the data they process, transmit, and store can be trusted, are available when needed, and are adequately protected from unauthorized access and use.

Internal controls are essential to the effective operation of local governments and school districts. They encompass the policies, procedures, and activities designed to provide reasonable assurance that operations are going according to plan. In general, properly designed and functioning controls reduce the likelihood that significant errors or fraud will occur and remain undetected. Internal controls over IT seek to ensure that computer systems and the data they process, transmit, and store can be trusted, are available when needed, and are adequately protected from unauthorized access and use.

The governing board's responsibilities for internal controls primarily involve oversight, authorization, and ethical leadership. Generally, governing boards do not design internal controls or develop the written policies they adopt. The governing board relies upon management, primarily the chief executive officer (CEO), to create the policies needed to ensure that services are provided effectively and assets are safeguarded. The CEO in turn relies upon managers and department heads to recommend and implement procedures. Some local governments and school districts employ an IT vendor for assistance with IT internal controls.

An important way that governing boards fulfill their oversight responsibilities is by asking questions related to controls over financial and IT systems. Depending on how IT responsibilities are assigned, those questions might be directed to the CEO, IT manager, department head(s), and/or an IT vendor. Asking the right questions is not only an effective way to exercise oversight, it can be done at little or no cost. On the other hand, not asking the right questions may potentially expose computer systems, software, and data to loss or unauthorized use, which could prove to be very expensive.

It is understandable that someone with little or no IT knowledge might be apprehensive about asking questions concerning IT internal controls. However, a governing board has responsibility for the oversight of the entity's IT operations—whether or not its members are knowledgeable about computers or feel comfortable discussing IT. As you will note after reviewing the IT Governance Security Self-Assessment included at the end of this document, a background in IT is not necessary to ask questions about key IT internal controls and understand the answers. Extensive IT knowledge is also not necessary to perform certain procedures (e.g., review documents or reports) that can corroborate the answers to the self-assessment questions and help you understand the controls better.

Introduction to IT Security Fundamentals

Prior to examining your entity's IT internal controls, it is important to understand two concepts that are fundamental to how IT professionals approach data, network, and system security: the CIA triad and defense-in-depth. These concepts highlight the importance of looking at controls both individually and collectively and will help you place the internal controls in context.

CIA Triad

The CIA triad refers to an information security model made up of three main components: confidentiality, integrity, and availability. Each component represents a fundamental objective of information security. The CIA triad is a well-known model in information security development. It is applied in various situations to identify problems or weaknesses and to establish security solutions. The model is an industry standard with which most information systems professionals should be familiar.

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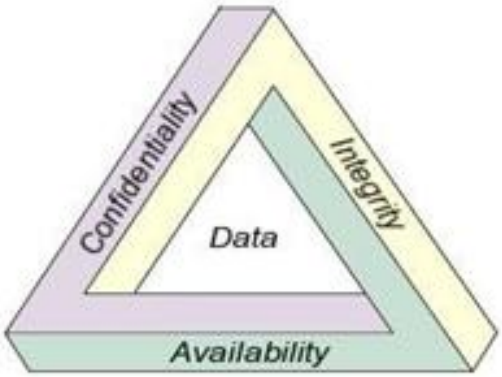
- **Confidentiality** is closely linked with privacy and relates to preventing or minimizing unauthorized access to, and disclosure of, data and information. To ensure confidentiality, information must be organized in terms of who ought to have access to it as well as its sensitivity.



- **Integrity** is focused on ensuring that data is not tampered with during or after submission. Having accurate and complete data is essential for good decision-making. What good is the information if it cannot be trusted?

- **Availability** means that the information is available when it is needed. Data that cannot be accessed will prove to be of little value. The most available systems are accessible at all times and have safeguards against power outages, natural disasters, hardware failures, systems upgrades, and attempts by individuals with malicious intent to cause disruption.

Building successive layers of defense mechanisms at strategic points in the IT infrastructure can reduce the risk of a successful attack by someone with malicious intent and is considered a best practice by IT security professionals.

Defense-in-depth

Defense-in-depth refers to the implementation of multiple layers of security to protect data, networks, and systems. Building successive layers of defense mechanisms at strategic points in the IT infrastructure can reduce the risk of a successful attack by someone with malicious intent and is considered a best practice by IT security professionals. A combination of controls helps ensure that your system does not become overly dependent on any one control or layer of security, and provides added protection in case a layer of security fails to function properly or does not prevent or stop a threat to your data or system. There is no single control that can be used to adequately protect against today's sophisticated threats; only a combination of multiple preventive and detective controls will keep your data and systems safe.

Information Technology Governance: Security Self-Assessment

The Security Self-Assessment at the end of this document addresses key areas of IT internal controls such as policy, training, access and monitoring. Several of the main questions include follow-up questions that will provide information helpful for evaluating the answers. For example, one of the questions is: "Were all computer users provided IT security training?" The question is followed by a prompt to record the date(s) of training and who attended, if applicable. If all computer users were provided with IT security training but that training occurred six years ago, the governing board may want to consider arranging for additional training or a refresher in the near future. Likewise, if only a small handful of computer users have received IT security training, the governing board should be aware of that as well.

Some questions are followed by a suggested step you can take to verify and better understand the answer provided. For example, if an up-to-date list of computer equipment is maintained, you could obtain a copy of the inventory listing and review it for reasonableness (i.e., does the inventory make sense given what you know about the entity and its operations). This would help you assess whether the list is truly up-to-date. For example, if the inventory of computer equipment does not include any laptop computers yet you have observed your municipality or school district staff working on laptop computers, you may want to ask a follow-up question about the apparent omission from the records. Similarly, when completing the access controls section of the assessment, you could review a current list of authorized computer users and their levels of access. If names on the list are unrecognizable or if the list contains individuals no longer employed by the municipality, you could ask appropriate follow-up questions. In addition, questions about access to particular software applications may arise. For example, a member of the governing board may notice that someone with no accounting responsibilities has access to the entity's accounting program.

The following guidance will help you to understand each control on the self-assessment and why it is important to the security and oversight of your computer operations. It should be noted that the manner in which the answers to the questions are obtained is up to the governing board. Board members could interview the IT manager and/or IT vendor (if applicable) in person, and ask follow-up questions or obtain additional information for clarification purposes at that time. Alternatively, the governing board could give the self-assessment to the appropriate responsible parties and ask that they complete and return it. In any event, the governing board will probably need to speak with IT personnel to ask additional questions, obtain more details regarding the answers provided and discuss the next steps to be taken. Since computing environments change over the course of time, governing boards should periodically review IT controls. We recommend that this be done at least once a year.

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IT Security: Top 12 Areas of Concern

Area #1 – IT Policy

Computer policies define appropriate user behavior, describe the tools and procedures needed to protect data and information systems, and explain the consequences of policy violations.

Computer policies define appropriate user behavior, describe the tools and procedures needed to protect data and information systems, and explain the consequences of policy violations. The governing board should provide important oversight and leadership by establishing computer policies that take into account people, processes, and technology; communicating the policies throughout the organization; and ensuring there are procedures in place to monitor compliance with policies.

Your unique computing environment should dictate the content and number of policies necessary. A small entity with uncomplicated, modest computing resources may only need a few policies to cover relevant computing issues adequately. Larger entities with complex systems may need several policies to convey management's expectations and ensure effective operation. While computer policies will not guarantee the safety of your computer system, a lack of appropriate policies significantly increases the risk that data, hardware, and software systems may be lost or damaged by inappropriate access and use.

Possible types of computer policies include but are not limited to:

- **Breach Notification Policy –** New York State Technology Law Section 208 requires local governments to establish an information breach notification policy. The policy should detail how officials would notify State residents whose private information was, or is reasonably believed to have been, acquired by a person without a valid authorization. The disclosure should be made in the most expedient time possible and without unreasonable delay, consistent with the legitimate needs of law enforcement and any measures necessary to determine the scope of the breach and restore the reasonable integrity of the data system. If you fail to adopt an information breach notification policy and private information is compromised, officials and employees may not understand or be prepared to fulfill their legal obligation to notify affected individuals.

- **Internet, Email, and Personal Computer Use –** This policy should describe what constitutes appropriate and inappropriate use of IT resources, along with your expectations concerning personal use of IT equipment and user privacy (e.g., management reserves the right to examine email, personal file directories, web access, and other information stored on local government computers, at any time and without notice). It should also describe the consequences for policy violations (e.g., an employee found to have violated the policy may be subject to disciplinary action, up to and including termination of employment).

- **Use of and Access to Personal, Private, and Sensitive Information –** This policy should: define personal, private, and sensitive information (PPSI); explain the entity's reasons for collecting PPSI; and describe specific procedures for the use, access to, storage, and disposal of PPSI involved in normal business activities.

- **Password Security –** This policy should address password complexity, length, age requirements, reuse of old passwords, and the number of failed log-on attempts the system will allow.

- **Wireless Security Policy –** This policy should specify the conditions that wireless infrastructure devices must satisfy to connect to the entity's network. The policy should also indicate who is covered by the policy (e.g., all employees, contractors, consultants, temporary, and other workers) and describe the consequences of violating the policy.

- **Mobile Computing and Storage Device Policy –** The purpose of this policy is to control mobile computing and storage devices that contain or access your information resources. It should define the devices covered (e.g., organizationally owned and/or personally owned), procedures for reporting lost or stolen mobile computing and storage devices, the process used for gaining approval before connecting new devices to the system, and other user responsibilities.

- **Online Banking –** Before an entity begins processing financial transactions electronically, it should have a comprehensive policy that addresses online banking activities. The policy should include the following, consistent with the statutory and other legal responsibilities of the officers and employees involved:

  - What online banking activities will be used
  - What specific transaction types will be allowed
  - Who will authorize transactions
  - Who will record transactions/transfers
  - Who has access to online banking
  - Who will review and reconcile transfers, and how often
  - The procedures that will be followed when responding to potential fraudulent activity.

While computer policies will not guarantee the safety of your computer system, a lack of appropriate policies significantly increases the risk that data, hardware, and software systems may be lost or damaged by inappropriate access and use.

Area #2 – IT Security Training and Awareness

IT security training should explain the proper rules of behavior for using your IT systems and data, and communicate the policies and procedures that need to be followed.

The IT security community often identifies people as the weakest link in the chain to secure data and systems, so it's no surprise that good internal controls should include entity-wide IT security training and awareness efforts that are closely tied to the organization's IT policies. Entities cannot protect the confidentiality, integrity, and availability of their data and computer systems without ensuring that the people who use and manage IT understand organizational IT security policies and procedures and their roles and responsibilities related to IT security.

There have been many accounts of users whose actions caused significant harm to computer systems or financial losses. They may have been fooled, via social engineering scams,[1] into providing their passwords, opening harmful attachments, or visiting malicious websites. Even system administrators, who are typically regarded as having advanced IT knowledge, have been tricked into performing actions that threatened or caused harm to their systems. The success of social engineering, coupled with the never-ending flow of new and innovative threats, underscores the importance of including all users in IT security training. It is also important to update the training material periodically to address new technologies, threats, and any changes to your computing environment.

IT security training should explain the proper rules of behavior for using your IT systems and data, and communicate the policies and procedures that need to be followed. The content of training programs should be directed at the specific audience (e.g., user or system administrator) and include everything related to IT security that attendees need to know in order to perform their jobs. While your IT policies tell users what to do, training provides them with the skills to do it. IT security awareness efforts should reinforce your IT policies and training, and can focus attention on security in general or some narrow aspect of security (e.g., the dangers of opening an unknown email or attachment or how to maintain laptop security while traveling).

[1] Social engineering is a term that describes a nontechnical kind of intrusion that often involves tricking people into breaking normal security procedures. Social engineers, otherwise known as con artists or confidence men, have become extremely adept at siphoning small bits of information from various sources and putting them together to conduct a very convincing lie. For example, from a municipal website, an attacker may be able to glean the names and some personal information of all the elected officials, board members, and possibly even contractors working for the local government. The name of the web designer or the web design company will also be present. With a little research into the local area, a skilled social engineering can conduct an attack whereby they call a municipal official, pretend to be an employee of the web design firm, use the first names of other officials or workers to sound legitimate, perhaps even add information about a local business or event, and convince the official to give up some sensitive information, such as a password, PIN, or device type and version. If the attacker can make a visit to the local government, his chances of a successful attack could increase. Often, the names and telephone numbers of IT consultants are placed on devices such as printers and fax machines. Other common social engineering schemes include shoulder surfing, tailgating, dumpster diving, and simply asking questions in a nice manner.

The failure to provide IT security training and raise awareness increases the risk that users will not understand their responsibilities, putting the data and computer resources with which they have been entrusted at greater risk for unauthorized access, misuse, or abuse. For example, without training and awareness, officers and employees may not be prepared to fulfill their legal obligation to notify affected individuals when personal, private, or sensitive information is compromised.

Local officials sometimes say that they cannot afford the cost of IT security training and awareness. Fortunately there are a number of no-cost or low-cost solutions available from a variety of sources.

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New York State Office of Cyber Security (NYS OCS)

www.dhses.ny.gov/ocs

The NYS OCS is dedicated to protecting the State's cybersecurity infrastructure by identifying and mitigating vulnerabilities, deterring and responding to cyber-events, and promoting cybersecurity awareness. Its website contains a wealth of information such as model policies, best practices, alerts and advisories, free training opportunities, and education and awareness materials. The Local Government Resources page, **www.dhses.ny.gov/ocs/local-government**, includes individual tabs for Government Officials, Technical Staff, Awareness, Training, and Events.

Government Officials – Provides reference materials designed for elected officials, administrative officials, and business managers. The topics include: *Risk Management, Guidelines for Backing Up Information, Internet and Acceptable Use Policy Template, Beginners Guide to Firewalls, and Secure Credit Card Payment Process.*

Technical Staff – Provides links to OCS cybersecurity advisories such as: *A CEO's Guide to Cyber Crime, Web 2.0 Security for Businesses and Employees, and Information and Recommendations Regarding Unauthorized Wire Transfers Relating to Compromised Cyber Networks*, as well as advisories and headlines from the Multi-State Information Sharing and Analysis Center (MS-ISAC).

The major associations (e.g., New York Conference of Mayors, New York State School Boards Association) offer low-cost training on timely and relevant IT security issues that is delivered by qualified presenters.

Awareness – Offers links to *Monthly Tips Newsletters* that local governments and school district officials are encouraged to download, customize with their own official headings and distribute to their employees, and to *White Paper* Resources and Publications issued by the MS-ISAC.

Training – Offers links to a variety of training videos such as *Cyber Security User Awareness, Cyber Security Training for Business Managers, and Information Classification Training*, and to various computer-based training courses such as the SANS Institute's webcasts. There is also a link to a mailbox where local government and school district officials may contact OCS for additional information. Lastly, OCS offers free, five-day training sessions throughout the year on topics such as Cyberterrorism First Responders and Comprehensive Cyberterrorism Defense.

Events – Links to the free *Annual Cyber Security Conference*, recorded sessions of past presentations, and live or archived bi-monthly national webcasts.

United States Computer Emergency Readiness Team (US_CERT)

http://www.us-cert.gov/

Four products in the National Cyber Alert System offer a variety of information for users with varied technical expertise. Those with more technical interest can read the Technical Cyber Security Alerts or the Cyber Security Bulletins. Users looking for more general-interest pieces can read the Cyber Security Alerts and Cyber Security Tips. A free subscription to any or all of the National Cyber Alert System products ensures access to timely information about security topics and threats.

Municipal and School District Associations

The major associations (e.g., New York Conference of Mayors, New York State School Boards Association) offer low-cost training on timely and relevant IT security issues that is delivered by qualified presenters.

TEEX Domestic Preparedness Campus

http://www.teexwmdcampus.com/index.k2

This website is a joint effort of the Department of Homeland Security, FEMA, and the Texas A&M University system. It has a free online training program entitled *DHS/FEMA Certified Cyber Security Training* that is eligible for continuing professional education credits. The program includes 10 courses in three discipline-specific tracks: non-technical for end-users, technical for IT professionals, and business managers and professionals.

In-House Training and Awareness

Developing and delivering IT security training, and maintaining IT security awareness, does not have to be an elaborate, expensive endeavor. It can be as simple as gathering staff together to review your policies collectively and having a roundtable discussion on security matters applicable to your computing environment. The discussions could center on: emerging trends in information theft and other social engineering reminders; limiting the type of personal, private, and sensitive information collected, accessed, or displayed to that which is essential for the function being performed; malicious software; virus protection; the dangers of downloading files and programs from the Internet; passwords; Wi-Fi security; and/or how to respond if a virus or an information security breach is detected. Awareness efforts could also include disseminating applicable security alerts from the organizations mentioned above and/or sending out periodic security reminders via email that address some aspect of your IT security policy.

IT security training and awareness is an essential part of protecting computer systems and data. Your personnel should understand their IT responsibilities, be knowledgeable about potential threats, and be prepared to respond appropriately to everyday computing challenges, as well as less frequent events such as the loss of personal information. The growing availability and ease of obtaining free and low-cost training and awareness materials eliminates any excuse for not having a well-informed work force.

Your personnel should understand their IT responsibilities, be knowledgeable about potential threats, and be prepared to respond appropriately to everyday computing challenges, as well as less frequent events such as the loss of personal information.

Since different kinds of information require different levels of protection, the nature of the data has to be evaluated so that appropriate internal controls can be established and monitored.

Area #3 – Computer Hardware, Software, and Data Inventories

Entities should maintain detailed, up-to-date inventory records for all computer hardware, software, and data. The information maintained for each piece of computer equipment should include a description of the item including the make, model, and serial number; the name of the employee to whom the equipment is assigned, if applicable; the physical location of the asset; and relevant purchase or lease information including the acquisition date. Software inventory records should include a description of the item including the version and serial number, a description of the computer(s) on which the software is installed, and any pertinent licensing information.

In addition to hardware and software inventories, entities should maintain an inventory of information assets (i.e., data) that classifies the data according to its sensitivity and identifies where the data resides (e.g., servers, workstations, and laptops). Since different kinds of information require different levels of protection, the nature of the data has to be evaluated so that appropriate internal controls can be established and monitored. Data classification is the process of assigning data to a category that will help determine the level of internal controls over that data. In some instances, laws, regulations, or an entity's policies predefine the classification of each data type. Here is an example of a data classification scheme:

- **Public –** Information that is widely available to the public through publications, pamphlets, web content, and other distribution methods.

- **Internal Use –** Routine operational information that is not approved for general circulation and where unauthorized access, modifications, or disclosure would be inconvenient but would not result in financial loss or damage to public credibility. Examples include routine correspondence, employee newsletters, internal phone directories, and internal policies and procedures.

- **Confidential –** Confidential data is information that, in the event of unauthorized access, modifications, or disclosure, could result in significant adverse impacts on an organization's ability to perform critical work or compromise the integrity of the organization, its employees, its customers, or third parties. Examples include data used to produce payroll or vendor payments, preliminary drafts of bid specifications, and employee system passwords. It also includes any information concerning a person that can be used to identify, or assume the identity of, the individual. Examples include Social Security numbers and the combination of name, address, and date of birth.

- **Restricted Confidential –** Information where loss, unauthorized modification, or disclosure is likely to result in the most serious impacts to an organization's ability to fulfill its responsibilities. Examples include the organization's strategy for defending lawsuits, preliminary investigation results, and assessments of security vulnerabilities.

Entities cannot properly protect their computer resources, including data, if they do not know what resources they have and where those resources reside. The failure to maintain detailed, up-to-date hardware, software, and information inventory records exposes these valuable assets to an increased risk of loss, theft, or misuse. Without proper identification of all devices on a network, unauthorized devices and software can be easily introduced, putting organizational data at risk. A single compromised device can become a launching point for further network attacks, quickly turning one compromised machine into many. Furthermore, accurate inventory records are essential for effective patch management (see Area #6 – Patch Management) and software licensing compliance.[2] Poor records makes it unlikely that software patches necessary to address known security vulnerabilities can be applied on a timely basis, if at all. In addition, insufficient records increase the likelihood that you may inadvertently violate copyright laws by having more software users than licenses for a particular application and incur penalties as a result. The accuracy of inventory records should be verified through periodic physical inventories.

The failure to maintain detailed, up-to-date hardware, software, and information inventory records exposes these valuable assets to an increased risk of loss, theft, or misuse.

[2] Software typically comes with a license that grants end-users permission to use one or more copies of the product. Entities commonly closely track their license usage to help ensure they don't inadvertently utilize software in a manner that might constitute copyright infringement. The illegal use or distribution of software, also known as software piracy, can result in considerable penalties.

Area #4 – Contracts for IT Services

Developing a good SLA takes some effort, but can help avoid potentially costly misunderstandings and establish an efficient, secure computing environment.

Entities increasingly rely on third parties to provide a variety of IT-related services. For your protection and to avoid potential misunderstandings, there should be a written agreement between the entity and the computing service provider that states the entity's needs and expectations, and specifies the level of service to be provided by the independent contractor/vendor. In our experience, many of the IT contracts or service level agreements (SLAs) entities enter into are vague in terms of the services contracted for and the expected quality of those services. Such poorly worded agreements can, among other things, contribute to confusion over who has responsibility for various aspects of the IT environment (i.e., the entity or contractor), which ultimately puts the entity's data and computer resources at greater risk for unauthorized access, misuse, or loss.

The components of an SLA vary but can include identification of the parties to the contract; definitions of terminology; term/duration of agreement; scope/subject; limitations (what, if anything, is excluded); service level objectives and performance indicators; roles and responsibilities; nonperformance impact; pricing, billing, and terms of payment; security procedures; audit procedures; reporting; review/update; and approvals. Generally speaking, the more specific the SLA, the better; there should be no uncertainty about what the contractor will deliver, when it will be delivered, and how much it's going to cost. A vague agreement can lead to additional costs or cost increases you were not expecting.

It is very important for an SLA to establish *measurable* targets of performance so a common understanding of services can be achieved. For example, if you contract with an IT vendor to administer patch management with the goal of ensuring that patches and updates that are released throughout the year are installed on a timely basis, the SLA should indicate exactly what operating system(s) and application(s) are covered and what "timely" means (e.g., is the expectation that patches be applied as soon as available, on a weekly basis, or on a quarterly basis?). An SLA with a cloud service provider could, for example, indicate that you will have availability to an application 99.95 percent of the time, and allow the municipality to reduce its payment by a given percentage if that is not achieved.

Many IT service providers have standard SLAs – reflecting various levels of service at different prices – that can be a good starting point for negotiation. Ideally, SLAs should be reviewed by knowledgeable IT staff and/or legal counsel, and periodically re-reviewed, especially if your IT environment or needs change significantly. Developing a good SLA takes some effort, but can help avoid potentially costly misunderstandings and establish an efficient, secure computing environment.

Area #5 – Virus Protection

A key IT control is the implementation and maintenance of adequate virus protection, including the updating of virus definitions. Without current virus definitions, protection is limited and leaves computers at risk of being compromised by new types of threats. Viruses can corrupt data and make computers and networks inoperable. Damage caused by viruses can be expensive to fix and can cause significant losses in productivity until corrected. Antivirus definitions should be updated daily and set to scan for threats throughout the day.

Some entities use a mix of purchased and free antivirus software (downloaded from the Internet). While there is nothing inherently wrong with using different kinds of antivirus software, it may make timely, coordinated management of antivirus protection more challenging. The use of free antivirus software should be carefully considered. Due to the nature of the free license agreements, most free antivirus software is for home use only.

Some malicious content is written to automatically propagate, or spread itself, across any new system it discovers. Because malware can be embedded onto a wide variety of devices, it is in the best interest of any organization to force scans of any newly discovered devices, such as flash drives and digital cameras, while the autoplay feature for USB devices should be disabled.

If antivirus is installed on a computer running Microsoft Windows, an icon should be present near the system clock on the taskbar. Right-clicking on the icon will bring up a menu which allows access to the program's registration information, latest update, and version number. If an icon is not present, the antivirus program may be accessed through the Start Menu or the Control Panel.

A key IT control is the implementation and maintenance of adequate virus protection, including the updating of virus definitions.

The first step in implementing adequate access controls is determining what level and type of protection is appropriate for various resources (e.g., data) and who needs access to these resources.

Area #6 – Patch Management

A "patch" is software that is used to correct a problem, such as a security vulnerability, that exists within an application or an operating system. Security vulnerabilities in software can be exploited to infect a computer with a virus, spyware, or other malicious agents, or to gain access privileges illicitly. When security vulnerabilities in software are discovered, the software vendor typically issues a patch (fix) to correct the problem. The patch should be applied as soon as possible to reduce the likelihood that someone with malicious intent could successfully exploit the vulnerability. You should adopt patch management policies and procedures that ensure that all patches and updates are rolled out on a regular basis.

Area #7 – Access Controls

The first step in implementing adequate access controls is determining what level and type of protection is appropriate for various resources (e.g., data) and who needs access to these resources. The objectives of limiting access are to ensure that: outsiders (e.g., attackers) cannot gain unauthorized access to your systems or data, access to sensitive resources such as operating systems and security software programs are limited to very few individuals who have a valid business need for such access, and employees and contractors are restricted from performing incompatible functions or functions beyond their responsibilities.

There should be written procedures in place for granting, changing, and terminating access rights to the overall networked computer system and to specific software applications. These procedures should establish who has the authority to grant or change access (e.g., department manager approval) and allow users to access only what is necessary to complete their job duties. Access rights should be updated as necessary; inactive, retired, or terminated accounts should be disabled or removed from the network in a timely manner.

You should periodically compare the employee master list (as maintained by the personnel or payroll department) to the list of network user accounts to determine if user accounts belong to current employees. A review of all system accounts should be periodically conducted and any account that cannot be associated with an authorized user or application should be disabled. Furthermore, you should establish and follow a process for revoking system access by disabling accounts immediately upon termination of an employee or vendor. After an account is disabled, any files associated with that account should be moved to a secure file server for analysis by IT or management personnel. Where possible, system administrators should monitor attempts to access disabled accounts through audit logging.

To help ensure individual accountability within the network, each user should have his or her own network account (username and password). Likewise, to help ensure individual accountability within software applications, each user should have his or her own user account (username and password). If users share accounts, accountability is diminished and activity in the system may not be able to be traced back to a single user.

Access should be assigned within the network based upon what resources a user needs to complete his/her job duties. For example, if there are shared folders on the network, a user within the highway department should only have access to the folders he or she needs—which would most likely not include the personnel department's folders. Likewise, someone with accounting duties should only have access to the portion of your financial accounting system he or she needs to perform the job.

Access should be assigned within the network based upon what resources a user needs to complete his/her job duties.

Users should be able to set their own passwords. If passwords are set for users, there is limited accountability because someone else knows the password.

Holding passwords to certain requirements makes passwords more difficult to crack or be easily guessed. Here are some criteria you should consider with regard to passwords:

- **Complexity Requirements**–A complex password should contain at least one uppercase character, one lowercase character, one numeric character, and one special character (e.g., %, #, @) and not include names or words that can be easily guessed or identified using a password-cracking mechanism or dictionary. Furthermore, the password should not contain any part of the account, network, or municipality names.
- **Length**–Passwords should be sufficiently long; that is, at least eight characters in length. Passwords longer than eight characters may provide greater security, but those benefits could be offset by people having to write down the password in order to remember it.
- **Aging–**Passwords should be changed periodically, about every 30 to 90 days. The more sensitive the system or data involved, the more frequently passwords should be changed.
- **Reuse of Old Passwords–**Users should be prohibited from reusing their last six passwords at a minimum.
- **Failed Log-On Attempts–**To prevent password guessing and online password attacks, failed log-on attempts should be limited to three to seven consecutive attempts.

Area #8 – Online Banking

Some of the more popular types of electronic fraud targeting online banking that have emerged are phishing attacks, malware, and pharming.

There has been a significant increase in fraud involving the exploitation of valid online banking credentials. Some of the more popular types of electronic fraud targeting online banking that have emerged are phishing attacks,[3] malware,[4] and pharming.[5] In a typical scenario, the targeted user receives an email which either contains an infected attachment, or directs the recipient to a malicious website. Once the recipient opens the attachment or visits the website, malware containing a key logger or other data harvesting and reporting mechanism is installed on his/her computer, or the user is prompted to input his/her user name and password, which are collected for malicious use. A key logger is a small application that harvests login information, allowing the perpetrator to masquerade as the legitimate user or create another user account. Thereafter, fraudulent electronic cash transfers are initiated and directed to bank accounts in the United States or foreign countries.

Despite online banking establishments' security controls, there is no way to absolutely guarantee the safety of online banking. The tactics used to commit fraud can range dramatically in sophistication and continually evolve over time. Likewise, there is no single control that is most effective against cyberattacks. A best practice for protecting IT systems and information is to build successive layers of defense mechanisms, a strategy referred to as defense-in-depth, a concept discussed earlier in this document.

[3] Phishing attacks use fake email messages pretending to represent a bank. The email requests information such as name, password, and account number and provides links to a counterfeit website.

[4] Malware is malicious software that is typically installed without the user's knowledge or consent. Such programs can capture keystrokes for login information, monitor and capture other data to authenticate identity, generate web pages that appear to be legitimate but are not, and hijack a browser to transfer funds without the user's knowledge, among other things. Viruses, trojans, spyware, rootkits, and worms are all examples of malware.

[5] Pharming involves the installation of malicious code on a computer and can take place without any conscious action on the part of the user. For example, a user can open an email or email attachment that installs malicious code and later redirects the user to a fake website that closely resembles a particular bank's site. Information provided while on the fake website is visible to an attacker.

Entities should have both technology-based (e.g., up-to-date virus protection) and nontechnical controls (e.g., written policies and recurring information security awareness training for all employees who use computers connected to the Internet and/or the local government's network). Furthermore, although online banking fraud is often committed by external parties, risks posed by employees must also be considered. The ease and speed with which large amounts of money can be transferred between accounts and banks requires heightened attention to traditional internal controls, such as the proper segregation of duties and timely reviews of online banking transactions.

Whenever possible, a wired rather than wireless network should be used for financial transactions. If a wireless network must be used, certain security measures should be in place (see Area #9 – Wireless Network). **It is also critical that bank accounts be monitored on a timely basis, at least every two or three days, for unauthorized or suspicious activity. Any suspicious activity should be immediately report to banking officials and/or law enforcement.** The window of time in which recoveries can be made from fraudulent online banking transactions is limited, and a rapid response may prevent additional losses.

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Area #9 – Wireless Network

Wireless networks are exposed to many of the same types of threats and vulnerabilities as wired networks, including viruses, malware, unauthorized access, and loss of data.

Wireless networks are exposed to many of the same types of threats and vulnerabilities as wired networks, including viruses, malware, unauthorized access, and loss of data. However, they are considered inherently less secure than wired networks because their information-bearing signals are broadcast or transmitted into the air. These traveling signals can, potentially, be intercepted and exploited by individuals with malicious intent. Since wireless networks are used as extensions of wired networks, the security problems of a wireless segment can affect an entire network. A wireless environment, therefore, requires certain additional security precautions.

Wireless Access Points (WAPs)

Wireless networks differ from wired networks in that they move data using radio frequency transmissions instead of establishing connections through network cables. Radio frequency has characteristics that make it well-suited for wireless communication—it can travel long distances and can penetrate solid objects. A wireless network employs wireless access points (WAPs) that are physically connected to the network through a networking cable, and wireless network interface cards (NICs) that are installed in each client device (e.g., computer, smartphone). The WAPs and wireless NICs send and receive radio frequency transmissions, thereby collectively establishing the wireless link. Since radio frequencies are relatively unimpeded by physical structures such as walls and windows, WAP signals can be picked up some distance away from the building in which they originate.

The physical deployment of wireless networking devices is the foundation on which a secure environment is created. Local governments should have the minimum number of WAPs necessary to meet their needs. WAP coverage should radiate out to the windows, but not beyond, to limit the ability of unauthorized users to gain access to the network. Management should consider locating WAPs toward the center of the building rather than near windows. If the access points are located near the windows, a stronger signal will be radiated outside the building, making it easier for people to find the access points. The goal is to avoid broadcasting where it is not necessary. WAPs should also not be located near interfering appliances (e.g., microwave ovens) which can adversely affect performance.

SSID

The name of the wireless network is known as the service set identifier (SSID). It is a name or description that is used to differentiate networks from one another. When wireless devices detect a network, the SSID is the name that is displayed. Most WAPs come with a default network name and similar models from the same manufacturer typically come with the same default network name (e.g., the default network name for most Linksys brand WAPs is LINKSYS). WAPs can be configured to either broadcast the SSID (open network) or could be set to disable broadcast (closed network).

- **Best Practice**–Change the SSID to a name that does not include identifiable information about the entity. Not changing the default SSID or using an SSID that identifies the WAP as belonging to a particular entity makes it easier for an unauthorized user to identify a specific target and gain access to that target faster.[6]
- **Best Practice**–Disable broadcast of the SSID so that wireless devices will not see the network name when they search for all available networks. This means that authorized end users will have to type in the SSID rather than select it from a listing of available wireless networks. With SSID broadcasting disabled, a password guessing attempt will have to guess the SSID along with the password or move to more advanced attacks to be successful.
- **Best Practice**–Change the SSID with some regularity to account for employees who are no longer authorized users (e.g., terminated employees).

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[6] For example, the Town of Safeville SSID should not be "townsafeville."

The security options available on a WAP generally range from no security to high security

Encryption

The security options available on a WAP generally range from no security to high security. A WAP can be set up to require the use of a password (different from the administrative password mentioned above) by any wireless device authorized to connect to the network, as well as to determine which wireless encryption[7] method is used, if any. Currently, encryption options will include:

- **WEP (Wired Equivalent Privacy)–**WEP was the first encryption method available to wireless networks. Since there are free tools available on the Internet to crack a WEP key, it is not considered a secure method of encryption.
- **WPA (Wi-Fi Protected Access)–**WPA encryption fixes the shortcomings of WEP. Since its initial development, an even more enhanced version has emerged, WPA2. Given the choice between WPA and WPA2, WPA2 would represent the most secure option.
    - **Best Practice**–Enable the most secure encryption available *(currently WPA2)*.
    - **Best Practice**–Require the use of a strong password by any user authorized to connect to the network.
    - **Best Practice**–The Wi-Fi access password should not include any portion of the network name or any words identifying the organization.

[7] Encryption is the process of transforming information (plaintext) using an algorithm (cipher) to make it unreadable to anyone except those possessing special knowledge, usually referred to as a key, to decrypt the information.

Area #10 – Firewalls and Intrusion Detection

Firewalls

Networks that are connected to the Internet are physically connected to unknown networks and their users all over the world. While such connections are often useful, they also increase the vulnerability of computerized information to access and attack from unauthorized individuals. Firewalls consist of hardware and/or software that enforce boundaries between computer systems and the Internet. Firewalls control network traffic flows, using rule sets which specify which services will pass through the firewall and which services are kept out. Firewalls can also act as effective tracking tools and can perform important logging and auditing functions. For these reasons, the network administrator should log and periodically review firewall activities/events.

There are several types of firewalls, each with varying capabilities to analyze network traffic and allow or block specific instances by comparing traffic characteristics to existing policies. Understanding the capabilities of each type of firewall, designing firewall policies, and acquiring firewall technologies that effectively address an organization's needs are critical to achieving protection for network traffic flows.

There are many aspects to firewall management. For example, choosing the type or types of firewalls to deploy and their positions within the network can significantly affect the security policies that the firewalls can enforce. Firewall rules may need to be updated as the organization's requirements change, such as when new applications or hosts are added to the network. Firewall performance also needs to be monitored so that potential resource issues can be identified and addressed before components become overwhelmed. Logs and alerts that firewalls generate should also be continuously monitored to identify attempts to bypass network security controls—both successful and unsuccessful. Firewall rule sets and policies should be managed by a formal change management control process because of their potential impact to security and business operations, with rule set reviews or tests performed periodically to ensure continued compliance with the organization's policies. Firewall software should be patched regularly as vendors provide updates to address vulnerabilities and increase functionality.

Understanding the capabilities of each type of firewall, designing firewall policies, and acquiring firewall technologies that effectively address an organization's needs are critical to achieving protection for network traffic flows.

Intrusion detection is the process of monitoring the events occurring in a computer system or network and analyzing them for signs of possible incidents, which are violations or imminent threats of violation of computer security policies, acceptable use policies, or standard security practices.

Intrusion Detection

Intrusion detection is the process of monitoring the events occurring in a computer system or network and analyzing them for signs of possible incidents, which are violations or imminent threats of violation of computer security policies, acceptable use policies, or standard security practices.

Network-based intrusion detection systems (IDSs) capture or "sniff" and analyze network traffic in various parts of a network. On the other hand, host-based IDSs analyze activity to and from a particular computer or host.

Because the log information maintained may be too voluminous to review on a routine basis, the IDS should be implemented to selectively identify unauthorized, unusual, and sensitive access activity, such as:

- Attempted unauthorized access
- Access trends and deviations from those trends
- Access to sensitive data and resources
- Highly sensitive privileged access, such as the ability to override security controls
- Floods of data coming from or going to a particular host or group of hosts
- Access modifications made by security personnel
- Unsuccessful attempts to log on to a system.

Unauthorized, unusual, or sensitive access activity identified by the IDS should be reviewed and any apparent or suspected violations should be investigated. When a security violation occurs, appropriate action should be taken to identify and remedy the control weaknesses that allowed the violation to occur, repair any damage that has been done, and determine and discipline the perpetrator. It is important that an entity have formal written procedures for reporting security violations or suspected violations to the IT manager or other appropriate IT personnel so that multiple related incidents can be identified, other employees can be alerted to potential threats, and appropriate investigations can be performed. Such incidents might include multiple attacks by a common hacker or repeated infections with the same computer virus. It is important to note that seemingly innocuous or legitimate behavior could be a manual probe to collect data about a network or security over a network, and thus it is important that you provide for periodic manual review of network activity even with an automated IDS in place.

Area #11 – Physical Controls

Physical security controls restrict physical access to computer resources and protect these resources from intentional or unintentional harm, loss, or impairment. Such controls include guards, gates, and locks, and also environmental controls such as smoke detectors, fire alarms and extinguishers, protection from water damage, and uninterruptible power supplies.

Larger local governments and school districts may have a server room while smaller units may place servers next to a desk, under a desk, in a closet, in the middle of the room or other high-traffic area. You should inspect the location of computers and server areas/rooms and ensure that there are adequate physical security controls commensurate with the risks of physical damage or access.

Physical security controls restrict physical access to computer resources and protect these resources from intentional or unintentional harm, loss, or impairment

Area #12 – Service Continuity and Disaster Recovery

Backups

A backup is a copy of electronic information that is maintained for use if there is loss or damage to the original. Backups can be compressed to save space and encrypted to add security. There are four important components to any back-up process:

- Backing up data at regular intervals
- Verifying the data has been backed up
- Storing the backup media in a secure, (preferably off-site) location
- Verifying the ability to restore the backup data.

Some entities contract with a third party for data, application, and/or operating system backup. If that is the case, the entity should have a written agreement with the vendor that clearly describes the expectations for safeguarding the data, especially if it contains personal, private, and/or sensitive information (e.g., Social Security numbers). In addition, local governments should check with New York State Archives personnel to gain an understanding of the laws and regulations pertaining to off-site data storage. State Archives has issued a Records Advisory entitled Using a Data Storage Vendor that describes what a contract for data storage should include. **(http://www.archives.nysed.gov/a/records/mr_data_storage.shtml)**

Also see Local Government Cyber Security: Guidelines for Backing Up Information **(http://www.dhses.ny.gov/ocs/local-government/).**

You should develop a formal disaster recovery plan that addresses the range of threats to your IT system(s), distribute the plan to all responsible parties, and ensure that it is periodically tested and updated as needed.

Disaster Recovery Planning

Disaster recovery is the process by which an entity can resume business after a disruptive event. The event might be something large, such as a major flood, or something small, such as malfunctioning software caused by a computer virus. The plans need to encompass how employees will communicate, where they will go and how they will continue to do their jobs. The details can vary greatly depending on the size and scope of the entity and its computerized operations.

You should develop a formal disaster recovery plan that addresses the range of threats to your IT system(s), distribute the plan to all responsible parties, and ensure that it is periodically tested and updated as needed. The plan should focus on sustaining your critical business functions during and after a disruption. It is important that you analyze data and operations to determine which are the most critical and what resources are needed to recover and support them in the event of an emergency.

Additional Resources

New York State Office of Cyber Security **http://www.dhses.ny.gov/ocs/**

New York State Office of the State Comptroller **http://osc.state.ny.us/**

- *Local Government Information Security: The Cost of Inadequate Protections*
  http://osc.state.ny.us/localgov/pubs/research/snapshot/cybersecurity0811.pdf
- *Local Government Management Guide: Information Technology Security*
  http://osc.state.ny.us/localgov/pubs/lgmg/itsecurity.pdf
- *Local Government Management Guide: Management's Responsibility for Internal Control*
  http://osc.state.ny.us/localgov/pubs/lgmg/managementsresponsibility.pdf
- *Local Government Management Guide: The Practice of Internal Controls*
  http://osc.state.ny.us/localgov/pubs/lgmg/practiceinternalcontrols.pdf

United States Computer Emergency Readiness Team (US CERT) **http://www.us-cert.gov/**

Information Technology Governance

Security Self-Assessment

Date Assessment Completed: _____

		YES	NO	N/A
IT Policy				
1a	Are computer policies adopted, distributed, and updated as necessary?			
	List policies and dates adopted or last revised:			
1b	Was a data breach notification policy adopted?			
	Date adopted:			
IT Security Training and Awareness				
2a	Were all computer users provided IT security training?			
	Date(s) of training:			
	Who attended the training:			
2b	Are there other efforts to raise IT security awareness?			
	Describe awareness efforts:			
Computer Hardware, Software and Data Inventories				
3a	Is a detailed, up-to-date inventory of computer hardware maintained?			
	Review a copy of the hardware inventory and note when last updated:			

		YES	NO	N/A
3b	Is a detailed, up-to-date inventory of authorized software maintained?			
	Review a copy of the software inventory and note when last updated:			
3c	Has data been assigned to categories (data classification) that will help determine the appropriate level of controls?			
	Review a copy of the data classification, noting the categories and types of information in each:			
3d	Is a detailed, up-to-date inventory of data maintained?			
	Review a copy of the data inventory and note when last updated:			
Contracts for IT Services				
4a	Do contracts for IT services specify the level of service to be received?			
	Review the contract(s) and note the date signed:			
4b	Are there adequate controls over third-party (e.g., IT vendors or IT service organizations) access to personal, private and/or sensitive information?			
	Describe the controls in place to protect the data:			
	Describe how access by third parties is monitored:			

		YES	NO	N/A
Virus Protection				
5a	Is antivirus protection up-to-date on all computers?			
	Describe the process for updating antivirus protection:			
	Date of last antivirus protection update:			
5b	Is the autoplay feature for USB devices disabled?			
5c	Are USB and other removable media devices scanned upon connection to municipal devices?			
Patch Management				
6	Are software and operating system patches applied in a timely manner?			
	Describe the process for applying patches:			
	Describe the process for updating when an application is no longer supported by the vendor:			
Access Controls				
7a	Are unique network accounts created for each computer user?			
7b	Are unique software accounts created for each user where applicable?			
7c	Do any accounts exist that cannot be tied to an authorized user or application?			
	Describe the process for disabling terminated employee/vendor accounts:			
7d	Are passwords held to complexity requirements?			
	Describe the complexity requirement:			
7e	Are password changes enforced on a regular basis (e.g., 30 to 90 days)?			

		YES	NO	N/A
	Indicate how often passwords are changed and describe how the change is enforced:			
7f	Is sharing user IDs and passwords prohibited?			
7g	Are changes to access rights made on a timely basis (i.e., within three to five days of duty changes)?			
7h	Is a current list of authorized users and their levels of access maintained and periodically reviewed?			
	Review the list of authorized users and their levels of access.			
Online Banking				
8a	Do you have an online banking policy?			
	Review the policy.			
8b	Are online bank accounts monitored?			
	Who monitors the accounts?			
	How often are online accounts monitored?			
8c	Are two-person controls in place over transactions?			
	Who has access to online bank account(s)?			
8d	Are there dollar limits on transfers?			
	What is the limit?			
8e	Are there controls limiting what accounts money can be transferred to?			
	List accounts money can be transferred to:			

		YES	NO	N/A
8f	Is online banking only conducted from a wired rather than wireless network?			
8g	Is there a written agreement or contract with the bank?			
	Review the agreement and note the date signed:			
Wireless Network				
9a	Are wireless access points set up to limit broadcasting from beyond your offices?			
	Where are the wireless access points located?			
	How far does the wireless signal broadcast?			
9b	Has the service set identifier (SSID) been changed from the factory default?			
	What is/are the SSID(s)?			
9c	Is/are SSID(s) changed periodically?			
9d	Has the SSID broadcasting feature has been disabled?			
9e	Is the strongest encryption available used?			
	Note type of encryption used:			
Firewalls and Intrusion Detection				
10a	Does the unit have a firewall(s)?			
	Who is responsible for maintaining firewall updates and configurations?			
10b	Have firewall default accounts been removed/changed?			
10c	Are firewall activities/events logged?			
	Who reviews the logs?			

		YES	NO	N/A
	Are alerts about suspicious activities emailed to a certain individual? If so, who?			
10d	Does the unit have an intrusion detection system (IDS)?			
	How does the system respond to a suspicious event?			
	Who is responsible for reviewing the events captured by the IDS and taking appropriate action?			
	Are alerts about suspicious activities emailed to a certain individual? If so, who?			
Physical Controls				
11a	Is physical access to computers, servers, and wiring closets (if any) restricted?			
	View the computer, server and wiring closet areas/rooms.			
11b	Are areas with computers, servers and wiring closets climate-controlled and protected from fire and water damage?			
11c	Is there an uninterrupted power source?			
11d	Are manual inspections conducted for violations of physical security controls?			
	Who conducted the last inspection and on what date:			
Service Continuity and Disaster Recovery				
12a	Are systems, including data, applications and operating systems, periodically backed up?			
	How often?			

		YES	NO	N/A
	Date of last backup:			
	Date information was successfully restored from a backup copy:			
12b	Are backups stored offsite?			
	Where is the offsite storage and how is it secured?			
12c	Are backups of sensitive data encrypted?			
12d	Does the unit have a disaster recovery plan?			
	Review the plan and note date adopted:			
12e	Has the plan been distributed to responsible parties?			
	When was the last time the plan was tested?			
	What was the outcome of the testing?			
12f	Is the plan periodically adjusted based on test results and changing conditions?			
	Date plan last updated:			

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