IBM i
7.2

Security
Planning and setting up system security

IBM

Note

Before using this information and the product it supports, read the information in "Notices" on page 183.

This edition applies to IBM i 7.2 (product number 5770-SS1) and to all subsequent releases and modifications until otherwise indicated in new editions. This version does not run on all reduced instruction set computer (RISC) models nor does it run on CISC models.

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Contents

Planning and setting up system security

This topic collection provides you with detailed information about planning, setting up, and using your system security.

Determining your company's system security is one of the most basic and most important decisions that you will make during the course of building your security plan. With system security you need to balance the need to safeguard your valuable information and the need of users to access that information to successfully make your company thrive. To strike this balance you must understand the specific needs and goals of your company's current direction but also be aware of future needs. Your security plan must protect your resources but also must be flexible enough to grow as your company grows.

Several tools exist that can aid you in creating, configuring, and managing your system-level security on your server. It is important to note that security does not end with protecting the server and managing access to assets that are stored on the system. A complete security implementation needs to include not only system level security, but also network level security and transaction level security. This topic focuses on system-level security.

Use this information to develop a personalized plan that fits your company's specific system security needs. After you complete the planning phase of your system security, you can set up system security by using the instructions provided in this information.

What's new for IBM i 7.2

Read about new or significantly changed information for the Planning and setting up system security topic collection.

Miscellaneous updates have been made to this topic collection.

How to see what's new or changed

To help you see where technical changes have been made, this information uses:

- The » image to mark where new or changed information begins.
- The « image to mark where new or changed information ends.

To find other information about what's new or changed this release, see the Memo to Users.

PDF file for Planning and setting up system security

You can view and print a PDF file of this information.

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You can view or download the related manual:

- Security reference

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Related reference
Related information for Planning and setting up system security
Listed here are the product manuals and IBM Redbooks (in PDF format), Web sites, and information center topics that relate to the Plan and set up system security topic. You can view or print any of the PDFs.

Frequently asked questions

There are common questions about setting up and using system security.

Administrators and security officers are faced with a wide variety of options and solutions for protecting the systems that they manage. All of these potential solutions can be confusing and daunting; however, good system security involves understanding your basic security needs and the role that security plays within your company. To understand the value of security for your company and its systems, you should know what security means to you at its most basic level.

Questions customers often ask

You might have many questions as you begin to develop your company's security plan.

Here are the answers for some of the most common questions:

1. **Why is security important?**

   Answer: The information stored on your system is one of your most important business assets. This sensitive information can be customer accounts, payroll statements, and financial statements. You must balance the need for protecting this information with the need to allow your employees access to complete their job responsibilities. You need to keep three important objectives in mind when determining how to protect your information assets:

   - **Confidentiality:** Good security measures can prevent people from seeing and disclosing confidential information. On your systems, what information do you consider confidential? Which information should only a few select individuals be allowed to see and maintain?
   - **Integrity:** To some extent, a well-designed security system can ensure the accuracy of the information on your computer. With the right security, you can prevent unauthorized changes or deletions of data.
   - **Availability:** If someone accidentally or intentionally damages data on your system, you cannot access those resources until you recover them. A good security system can prevent this kind of damage.

   When people think about system security, they typically think about protecting their system from people outside the company, such as business rivals. Actually, protection against curiosity or system accidents by correct users is often the greatest benefit of a well-designed security system. In a system without good security features, a user might unintentionally delete an important file. A well-designed security system helps prevent this type of accident.

2. **Who should be responsible for security on my system?**

   Answer: Different companies take different approaches to security. Sometimes programmers have responsibility for all aspects of security. In other cases, the person who manages the system is also in charge of security. To determine who should be responsible for security on your system or systems, consider the suggested approach of:

   - Your method of planning security depends on whether your company purchases or develops applications. If you develop your own applications, communicate your security needs during the development process. If you purchase applications, understand and work with the application

designer. In both cases, the people who design applications should consider security as part of the design.

3. **Why should I customize security on my system?**

   Answer: A small system might have three to five users that run a few applications. A large system might have thousands of users on a large communications network running many applications. You have the opportunity to change many things about how the system looks to your users and how it performs.

   When your system first arrives, you probably will not need or want to do very much customizing. IBM ships your system with initial settings, called defaults, for many options. These defaults are the choices that typically work best for new installations.

   Note: All new systems ship with a default security level of 40. This security level ensures that only users who you have defined can use the system. It also prevents potential integrity or security risks from programs that can circumvent security.

   However, if you do some customizing, you can make your system a simpler and more effective tool for your users. For example, you can make sure that a user always gets the correct menu when signing on. You can make sure that every user's reports go to the right printer. Your users will feel that more confident about the system if you do some initial customizing to make it look and feel like their own system.

Questions customers should ask themselves

There are many decisions that must be made while developing and implementing your company's security plan.

Here are the answers for some of the most common questions you need to ask:

1. **Have I clearly defined my company's business requirements?**

   Answer: To plan and set up security on your systems effectively, you must first know what your business requires to function effectively and efficiently. You need to understand how your systems will be used within your company. For example, systems that contain critical applications, such as databases that contain your company accounts, need higher level of security than systems used for testing products within your company.

2. **What assets do I want to protect?**

   Answer: Your business assets comprise not only the physical systems that you manage, but also the data and information that is stored on them. To minimize theft and tampering, you need to create an inventory of your systems and the information that they store.

   The amount of security you need depends on the type of information stored on that system, the sensitivity of that information, and the consequences to your business if that data is stolen or compromised. Understanding the risks that your systems may face allows you to more effectively manage security on your systems.

3. **Do I have a company policy regarding security?**

   Answer: A security policy defines your company's requirements for protecting your company's resources, responding security-related incidents, and conducting secure business transactions with remote employees, business partners, and public customers. This security policy should entail physical security of your systems, network security issues, such as Internet access for employees, and measures for assessing and monitoring security on your systems. Think of your security policy as your foundation for all your security decisions. Your security policy needs to reflect your core business values, but also be flexible enough to accommodate future business demands.

4. **Do my employees have or need access to the Internet?**

   Answer: Today, most companies see the need to allow employees access to the Internet to conduct research and respond to customers related to daily operations of their businesses. Whenever you connect your systems and users to the Internet, your internal resources are at risk of an attack. To protect your network from these risks that are associated with Internet use, you need to decide which

network services will be allowed, how users will connect to the Internet, and how network security will be monitored in your network. Any decisions you make regarding the Internet and its use needs to be clearly defined and communicated to employees within your security policy. It is important to ensure that all your employees understand and sign a compliance agreement with these policies. Although implementing a network security policy is beyond the scope of this topic, you should include information regarding network security in your overall security policy.

Concepts

To effectively create a security policy and plan security measures for your system, you need to understand the following security concepts, some of which are general concepts and some of which are specific to the hardware type.

A small system might have three to five users and a large system might have several thousand users. Some installations have all their workstations in a single, relatively secure area. Others have widely distributed users, including users who connect by dialing in and indirect users connected through personal computers or system networks. Security on this system is flexible enough to meet the requirements of this wide range of users and situations. You need to understand the features and options available so that you can adapt them to your own security requirements. This topic provides an overview of the security features on the system.

System security has three important objectives:

Confidentiality:

- Protecting against disclosing information to unauthorized people.
- Restricting access to confidential information.
- Protecting against curious system users and outsiders.

Integrity:

- Protecting against unauthorized changes to data.
- Restricting manipulation of data to authorized programs.
- Providing assurance that data is trustworthy.

Availability:

- Preventing accidental changes or destruction of data.
- Protecting against attempts by outsiders to abuse or destroy system resources.

System security is often associated with external threats, such as hackers or business rivals. However, protection against system accidents by authorized system users is often the greatest benefit of a well-designed security system. In a system without good security features, pressing the wrong key might result in deleting important information. System security can prevent this type of accident.

The best security system functions cannot produce good results without good planning. Security that is set up in small pieces, without planning, can be confusing. It is difficult to maintain and to audit. Planning does not imply designing the security for every file, program, and device in advance. It does imply establishing an overall approach to security on the system and communicating that approach to application designers, programmers, and system users.

As you plan security on your system and decide how much security you need, consider these questions:

- Is there a company policy or standard that requires a certain level of security?
- Do the company auditors require some level of security?
- How important is your system and the data on it to your business?
- How important is the error protection provided by the security features?
- What are your company security requirements for the future?

To facilitate installation, many of the security capabilities on your system are not activated when your system is shipped. Recommendations are provided in this topic to bring your system to a reasonable

level of security. Consider the security requirements of your own installation as you evaluate the recommendations.

Basic terminology

This topic provides users with basic security terminology.

Object
An object is a named space on the system that you or an application can manipulate. Everything on the system that you or an application can work with is considered an object. Objects provide a common interface for working with system components. The most common examples of objects are files and programs. Other types of objects include commands, queues, libraries, and folders. Objects on the system are identified by object name, object type, and the library in which the object resides. You can secure each object on the system.

Library
A library is a special type of object that is used to group other objects. Many objects on the system reside in a library. Libraries are essentially containers, or organizational structures for other objects, and you can use them to reference other objects on your system. Libraries might contain many objects, and might be associated with a specific user profile or application. QSYS, which contains all other libraries on the system, is the only library that can contain other libraries. Objects in a library are handled like objects in a subdirectory. A library cannot live inside a directory.

Directory
A directory is a special object that provides another way to group objects on the system. Objects can reside in a directory and a directory can reside in another directory, forming a hierarchical structure. Each file system is a major *subtree* in the integrated file system directory structure. Directories are different from libraries in that the address of each library maps to the QSYS library while directories are not addressable. Names of libraries are restricted to 10 characters while directories can have longer names which might be case sensitive. Directories can have multiple names because the path to the directory is what is named and not the directory itself. You can use different commands and authority requirements when working with directories and libraries.

User profile
Every system user must have a user identity before they can sign on to and use a system. This user identity is a special object called a user profile, which only an administrator with appropriate system authority can create for a user.

Special authority
Special authority determines whether the user is allowed to perform system functions, such as creating user profiles or changing the jobs of other users.

Physical security
Physical security includes protecting the system unit, system devices, and backup media from accidental or deliberate damage. Most measures you take to ensure the physical security of your system are external to the system.

Application security
Application security deals with the applications you store on your system and how you will protect those applications while simultaneously allowing users access to them.

Resource security
Resource security on the system allows you to define who can use objects and how objects can be used. The ability to access an object is called *authority*. When you set up object authority, you need to be careful to give your users enough authority to do their work without giving them the ability to browse and change the system. Object authority gives permissions to the user for a specific object and can specify what the user is allowed to do with the object. An object resource can be limited through specific, detailed user authorities such as adding records or changing records. System resources can be used to give the user access to specific system-defined subsets of authorities: *ALL, *CHANGE, *USE, and *EXCLUDE. System values and user profiles control who has access to your system and prevent unauthorized users from signing on. Resource security controls the actions that authorized system users can perform, and the objects that they can access after they have signed on successfully. Resource security supports the main goals of security on your system to protect:

- Confidentiality of information
- Accuracy of information to prevent unauthorized changes
- Availability of information to prevent accidental or deliberate damage

Security policy
A security policy allows you to manage security on an IBM i system.

Related information
Security terminology

Security levels

Security on your system is arranged in a series of levels, with each level offering a greater degree of security and protection of your data than the previous level.

You can choose how much security you want the system to enforce by setting the security level (QSECURITY) system value. IBM i supports these fully-integrated system security levels:

- **Level 10: Password security**

  At security level 10, you have no security protection. Therefore, security level 10 is not recommended. Running at this security level is both a security and integrity risk as you do not have the protection of the higher security levels, 40 and 50, activated and being enforced.

- **Level 20: Password security**

  At this security level, users who need to access the system must have a password and user ID that the system recognizes. The system administrator creates both the user ID and initial password for users. This level of security allows users total authority to do anything they want on the system, which means that all users can access all data, files, objects, and so on, on your system because all users have *ALLJOB special authority. Therefore, security level 20 is not recommended. Running at this security level is both a security and integrity risk as you do not have the protection of the higher security levels, 40 and 50, activated and being enforced.

- **Level 30: Password and resource security**

  Level 30 provides more security functions in addition to what is provided at level 20. Users must have specific authority to use resources on the system. Users do not have automatic access to everything on the system and the system administrator must define a valid user ID and password for them. User access is limited by the security policies of the business. Level 30 is not considered a secure level as the integrity protection features available on security level 40 and 50 are not activated at security level 30. Running at this security level is both a security and integrity risk as you do not have the protection of the higher security levels, 40 and 50, activated and being enforced.

- **Level 40: Integrity protection**

  At this security level, resource security and integrity protection are enforced, and the system itself is protected against users. Integrity protection functions, such as the validation of parameters for interfaces to the operating system, help protect your system and the objects on it from tampering by experienced system users. For example, user-written programs cannot directly access the internal control blocks through pointer manipulation. Level 40 is the default security level for every new installation and is the recommended security level for most installations.

- **Level 50: Advanced integrity protection**

  At this security level, advanced integrity protection is added to the resource security and level 40 integrity protection enforcement. Advanced integrity protection includes further restrictions, such as the restriction of message-handling between system state programs and user state programs. Not only is the system protected against user-written programs, but it ensures that users only have access to data on the system, rather than information about the system itself. This offers greater security against anyone attempting to learn about your system. Level 50 is the recommended level of security for most businesses, because it offers the highest level of security currently possible. Also, level 50 is the required level for C2, FIPS-140, and Common Criteria certifications.

Related concepts

Planning system security
System security entails controlling user access and their privileges, maintaining information integrity, monitoring processes and access, auditing system functions, and providing backup and recovery of security related information.

Developing a security policy
Your security policy defines what you want to protect and what you expect of your system users.

Related information

Security level 10
Security level 20
Security level 30
Security level 40
Security level 50

Lockable security system values

You can lock the security-related system values to prevent users and programs from changing those values.

System service tools (SST) and dedicated service tools (DST) provide an option to lock these system values. By locking the system values, you can prevent even a user with *SECADM and *ALLOBJ authority from changing these system values with the **CHGSYSVAL** command. In addition to restricting changes to these system values, you can also restrict adding digital certificates to the digital certificate store with the Add Verifier API and restrict password resetting on the digital certificate store.

You can use system service tools (SST) or dedicated service tools (DST) to lock and unlock the security-related system values. However, you must use DST if you are in recovery mode because SST is not available in recovery mode. Otherwise, use SST to lock or unlock the security-related system values.

Related information

Lock function of security-related system values
Security reference

Global settings

Global settings affect how work enters the system and how the system appears to other users.

Global settings include the following items:

- Security system values, which control security on your system, fall into one of four groups:
  - General security system values
  - Other system values with security properties
  - System values that control passwords
  - System values that control auditing

  Think of system values as company policy. System values apply to everyone using the system, unless something more specific, such as a user profile, overrides the system value. System values allow you to customize many characteristics of your system, including system security characteristics. For example, you can define how many sign-on attempts to allow at a device, whether the system automatically signs off inactive workstations, how long passwords can be used and changed, and other password characteristics.

- Network attributes, which control how your system participates (or chooses not to participate) in a network with other systems.

- Subsystem descriptions, which determine how work enters the system and what environment the work runs in. A number of work management values have security implications.

- Communications configuration affects how work enters your system. You must protect communication to and from your system with the rest of the network.

Related information

Work management

User profiles

Every system user must have a user identity before they can sign on to and use a system. This user identity is called a *user profile*.

A user profile is a string of characters that uniquely identifies a user to a system. Only an administrator with appropriate system authority can create a user profile.

A user profile controls what the user can do and customizes the way the system appears to the user. A user profile contains the information that IBM i requires to allow users to sign on to a system, to access their own customized session, including their own message and output queue, and to access functions and objects to which they have been granted authority. Designing user profiles well can help you protect your system and customize it for your users. Every system user must have a user profile and a system administrator must create every user profile.

There are a number of parameters that an administrator can define for a user profile, including a number of security related attributes. Descriptions of a few important security attributes of the user profile are as follows:

- **Special authority:** Special authorities determine whether the user is allowed to perform system functions, such as creating user profiles or changing the jobs of other users.
- **Initial menu and initial program:** The initial menu and program determine what the user sees after signing on the system. You can limit a user to a specific set of tasks by restricting the user to an initial menu.
- **Limit capabilities:** The limit capabilities field in the user profile determines whether the user can enter commands and change the initial menu or initial program when signing on.

You can include a user profile in group profiles. In this way, all group members share access to specific objects and share ownership of objects. Group profiles can simplify many user administration tasks by allowing you to apply a single change to many users.

Related concepts

Planning user profiles
A user profile contains security-related information that controls how the user signs on the system, what the user is allowed to do after signing on, and how the user's actions are audited.

Changing a user profile
Job description changes, company policy updates, and personnel changes are some of the reasons that a user profiles will need to be changed.

Enabling a disabled user profile
Sometimes a valid user has difficulty getting onto the system and the user ID becomes locked. The profile needs to be re-enabled before the user can access the system.

Related information

User profiles
Roles of the user profile

Group profiles

A *group profile* is a special type of user profile that provides the same authority to a group of users.

You can use a group profile to perform the following tasks:

- Define authority for a group of users, rather than giving authority to each user individually.
- Own objects on the system.

- Use a group profile as a pattern when creating individual user profiles by using the copy profile function.

A group profile is a special type of user profile and can own objects on the system. Typically, you create a group profile for a set of users with similar system access and usage needs. For example, you might create a group profile for a set of users who need to use the same applications in the same way.

You can also use a group profile as a pattern when you create individual user profiles, either by using the copy-profile function or by using IBM Navigator for i, expanding **Users and Groups** then clicking **Create Group**.

A group profile servers two purposes on the system:

- **Security tool**: A group profile provides a simple way to organize who can use certain object authorities. Object authorities control who has permission to access and use objects on your system. You can define object authorities for an entire group rather than for each individual member of the group. A user can be a member of up to 16 group profiles.
- **Customization tool**: You can use a group profile as a pattern for creating individual user profiles. Most people who are part of the same group have the same customizing needs, such as the initial menu and the default printer. You can define these in the group profile and copy them to the individual user profiles.

You can use group profiles to make it easier to maintain a simple, consistent scheme for both security and customization.

You create group profiles in the same way that you create individual profiles. The system recognizes a group profile when you add the first member to it. At that point, the system sets information in the profile indicating that it is a group profile. The system also generates a group identification number (gid) for the profile. You can also designate a profile as a group profile at the time you create it by specifying a value in the gid parameter.

Related concepts

Planning group profiles
Use group profiles are to define authorities for a group of users, rather than giving authority to each user individually.

Creating a group profile
When you create a job description, you also need to a create group profile to define object authority for a group of users. Group profiles are a more efficient way to handle object authority than by giving authority to each user individually.

Authorization lists

Like a group profile, an authorization list allows you to group objects with similar security requirements and associate the group with a list of users and user authorities.

Authorization lists provide an efficient way to manage the authority to similar objects on the system and aid in the recovery of security information.

Providing each user with explicit access to every object they need to work with might create a great deal of duplicated effort, because many users need to access the same group of objects. A much easier way to provide this access is to create authorization lists. Authorization lists consist of a list of users or groups, the type of authority (*USE, *CHANGE, and *EXCLUDE) for each user or group, and a list of objects to which that this list provides access.

For example, you can create an authorization list to contain a list of objects related to an inventory database. A user responsible for ordering new inventory items can be granted authority to see the contents of the database objects. Additionally, a user group in shipping and receiving needs to update this database as parts come in and out of stock. This group can have authority to change the contents of the objects.

An authorization list has these advantages:

- Authorization lists simplify managing authorities. User authority is defined for the authorization list, not for the individual objects on the list. If a new object is secured by the authorization list, the users on the list gain authority to the object.
- One operation can be used to give a user authority to all the objects on the list.
- Authorization lists reduce the number of private authorities on the system. Each user has a private authority to one object, the authorization list. This gives the user authority to all the objects on the list. Reducing the number of private authorities in the system has the following advantages:
  - Reduces the size of user profiles.
  - Improves the performance when saving the system (SAVSYS) or saving the security data (SAVSECDTA).
- Authorization lists provide a good way to secure files. If you use private authorities, each user will have a private authority for each file member. If you use an authorization list, each user will have only one authority. Also, by default files that are open cannot have authority granted to the file or revoked from the file. If you secure the file with an authorization list, you can change the authorities, even when the file is open.
- Authorization lists provide a way to remember authorities when an object is saved. When an object is saved that is secured by an authorization list, the name of the authorization list is saved with the object. If the object is deleted and restored to the same system, it is automatically linked to the authorization list again. If the object is restored on a different system or logical partition, the authorization list is not linked, unless ALWOBJDIF(*ALL), ALWOBJDIF(*AUTL), or ALWOBJDIF(*COMPATIBLE) is specified on the restore command.

From a security management view, an authorization list is the preferred method to manage objects that have the same security requirements. Even when there are only a few objects that are secured by the list, there is still an advantage to using an authorization list instead of using private authorities on the object. Because the authorities are in one place (the authorization list), it is easier to change who is authorized to the objects. It is also easier to secure any new objects with the same security level authorities as the existing objects.

If you use authorization lists, you should not have private authorities on the object. Two searches of the users' private authorities are required during authority checking if the object is secured by an authorization list and has private authorities. The first search is for the private authorities on the object; the second search is for the private authorities on the authorization list.

Two searches require additional system resources and system performance can be impacted. If you use only the authorization list, only one search is performed. Also, because of the use of authority caching with the authorization list, the performance for the authority check will be the same as it is for checking only private authorities on the object.

Comparison of group files and authorization lists

Group profiles are used to simplify managing user profiles that have similar security requirements. Authorization lists are used to secure objects with similar security requirements.

The table provided shows comparisons of group profiles and authorization lists.

Table 1. Authorization list and group profile comparison		
Usage considerations	**Authorization List**	**Group Profile**
Can use to secure multiple objects	Yes	Yes
User can belong to more than one	Yes	Yes
Private authority overrides other authority	Yes	Yes

Table 1. Authorization list and group profile comparison (continued)		
Usage considerations	**Authorization List**	**Group Profile**
User must be assigned authority independently	Yes	No
Authorities specified are the same for all objects	Yes	No
Object can be secured by more than one	No	Yes
Authority can be specified when the object is created	Yes	Yes
Can secure all object types	No	Yes
Association with object is deleted when object is deleted	Yes	No
Association with object is saved when the object is saved	Yes	No

You can find more detailed information about authorization lists in "Comparison of group profiles and authorization lists" in the *IBM i Security Reference*.

Related concepts

Planning authorization lists
You can group objects with similar security requirements by using an authorization list.

Validation list objects

Validation list objects provide a method for applications to securely store user authentication information.

You can use validation list objects to perform the following tasks:

- Securely store user authentication information for applications.
- Provide an authorization mechanism for users who do not have and do not need an IBM i user profile, such as internet users.

Validation list objects provide a method for applications to securely store user authentication information.

For example, the Internet Connection Server (ICS) uses validation lists to carry out the concept of an *internet user*. Validation lists allow ICS to perform basic authentication before a web page is served. Basic authentication requires users to provide some type of authentication information, such as a password, PIN, or account number. The name of the user and the authentication information can be stored securely in a validation list. The ICS can use the information from the validation list rather than require all users of the ICS to have a system user ID and password.

An internet user can be permitted or denied access to the system from the web server. The user, however, has no authority to any system resources or authority to sign-on or run jobs. A system user profile is never created for the internet users.

Validation list objects are available for all applications to use. For example, if an application requires a password, the application passwords can be stored in a validation list object rather than a database file. The application can use the validation list APIs to verify user passwords, which are encrypted, rather than the application performing the verification itself.

Related information

Security reference

Menu security

Menu security controls which menu functions a user can perform.

This system was originally designed as a follow-on product for S/36 and S/38. Many system installations were, at one time, S/36 or S/38 installations. To control what users can do, security administrators on those earlier systems often used a technique that is referred to as *menu security* or *menu access control*.

Menu access control means that when a user signs on, the user sees a menu. The user can perform only those functions that are on the menu. The user cannot get to a command line on the system to perform any functions that are not on the menu. In theory, the security administrator does not need to worry about authority to objects because menus and programs control what users can do.

Note: Menus are not secure if the system allows any network interfaces to access the system. Most network interfaces do not know anything about menu security.

Related concepts

Setting up menu security
There are several user profile parameters used for setting up menu security.

User security

From a user's point of view, security affects how they use and complete tasks on the system.

User security includes how users interact with the system to complete their tasks. It is important to consider how a user will view security. For example, setting passwords to expire every five days might frustrate and interfere with a user's ability to complete his or her job. However, too lax a password policy might cause security problems.

To provide the right security for your system, you need to divide security into specific parts that you can plan, manage, and monitor. From a user's point of view, you can divide your system security into several parts.

User security includes all areas where security affects the users and where users can affect the system. Key components of user security include:

- **Physical access to the system**

  Physical security protects the system unit and all system devices, including backup storage media, such as diskettes, tapes, or CDs from accidental or intentional loss or damage. Most measures you take to ensure the physical security of your system are external to the system.

- **How users sign-on**

  Signon security prevents a person who is not identified on the system from signing on. To sign on, an individual must present valid credentials, such as entering a valid combination of user ID and password. You can use both system values and individual user profiles to make sure that your sign-on security is not violated. For example, you can require that passwords be changed on a regular basis. You can also prevent the use of passwords that are easy to guess.

- **What users are allowed to do**

  An important role of security, and of system customization, is to define what users can do. From a security perspective, this is often a limiting function, such as preventing people from seeing certain information. From a system customizing perspective, this is an empowering function. A properly customized system makes it possible for people to do their jobs well by eliminating unnecessary tasks and information. Some methods for defining what users can do are appropriate for the security officer, while others are the responsibility of programmers. This information focuses primarily on those things that a security officer typically does. Parameters are available in individual user profiles, job descriptions, and classes to control what the user can do on the system. The list below briefly describes the techniques available:

  - Limiting users to a few functions.

    You can limit users to a specific program, menu or set of menus, and a few system commands based on their user profile. Typically, the security officer creates and controls user profiles.

- Restricting system functions.

  System functions allow you to save and restore information, manage printer output, and set up new system users. Each user profile specifies which of the most common system functions that the user can perform. You perform system functions by using control language (CL) commands and APIs. Because every command and API is an object, you can use object authorities to control who can use them and complete system functions.

- Determining who can use files and programs.

  Resource security provides the capability to control the use of every object on the system. For any object, you can specify who can use it and how they can use it. For example, you can specify that one user can only look at the information in a file; another user can change data in the file; a third user can change the file or delete the entire file.

- Preventing abuse of system resources.

  The processing turn on your system can become just as important to your business as the data that you store on it. The security officer helps to ensure that users do not misuse system resources by running their jobs at a high priority, printing their reports first, or using too much disk storage.

- How your system communicates with other computers.

  Additional security measures may be necessary if your system communicates with other computers or with programmable workstations. If you do not have correct security controls, someone on another computer in your network can start a job or access information on your computer without going through the sign-on process. You can use both system values and network attributes to control whether you allow remote jobs, remote access of data, or remote PC access on your system. If you allow remote access, you can specify what security to enforce. You can find descriptions for all system values in Chapter 3, "Security System Values," of the *Security Reference*.

- How to save your security information.

  You need to regularly back up the information on your system. In addition to saving the data on your system, you need to save security information. If a disaster occurs, you need to be able to recover information about system users, authorization information, and the information itself.

- How to monitor your security plan.

  The system provides several tools for monitoring security effectiveness:

  - Messages are sent to the system operator when certain security violations occur.
  - Various security-related transactions can be recorded in a special audit journal.

  "Monitoring security" on page 163 discusses the use of these tools in general terms. You can find more details on security auditing in Chapter 9, "Auditing Security on the System," in the *Security Reference*.

- How to customize the security on your system.

  You can customize your system to help your users accomplish their daily work. To best customize your system for your users, think of what they need to accomplish their work successfully. You can customize the system to show menus and applications in several ways:

  - Show users what they want to see.

    Most of users arrange their desks and their offices so they can easily reach the things that they need most. Think of your users' access to the system in the same way. After signing on to the system, a user should first see the menu or display that person uses the most. You can easily design user profiles to make this happen.

  - Eliminate unnecessary applications.

    Most systems have many different applications on them. Most users only want to see the things they need to do their jobs. Limiting them to a few functions on the system makes their jobs easier. With user profiles, job descriptions, and appropriate menus, you can give each user a specific view of the system.

  - Send something to the right output location.

Users should not worry about how to get their reports to the correct printer or how their batch jobs should run. System values, user profiles, and job descriptions do these things.

– Provide assistance.

No matter how well you succeed in customizing the system, users may still wonder "Where is my report?" or "Has my job run yet?" Operational Assistant displays provide a simple interface to system functions, which help users answer these questions. Different versions of system displays, called assistance levels, provide help for users with different levels of technical experience. When your system arrives, Operational Assistant displays are automatically available for all users. However, the design of your applications may require you to change the way users get access to the Operational Assistant menu. The system provides tools which allow you to customize your system security to protect your resources while allowing users to access those resources.

Related concepts

Planning user security
Planning user security includes planning all areas where security affects the users on your system.

Setting up user security
You need to set up security for every person who will be authorized to use your system. User security set up involves installing application libraries, and setting up user groups and profiles.

Saving security information
You need to plan how you will save and restore security information.

Related information

Recovering your system
Security reference

Resource security

You can use resource security on the system to control the actions of authorized users after successful authentication.

System values and user profiles control who has access to your system and prevent unauthorized users from signing on. Resource security controls the actions that authorized system users can perform after they have signed on successfully. Resource security supports the main goals of security on your system to protect:

• Confidentiality of information.

• Accuracy of information to prevent unauthorized changes.

• Availability of information to prevent accidental or deliberate damage.

The security officer protects the resources (objects) on the system by determining who has the authority to use them and how user can access these objects. The security officer can set object authorities for individual objects or for groups of objects (authorization lists). Files, programs, and libraries are the most common objects requiring protection, but system security allows you to set object authorities for any object on the system.

You can manage resource security easily and effectively, if you plan a straightforward approach in advance. A resource security scheme created without prior planning can become complicated and ineffective.

Resource security on the system allows you to define who can use objects and what operations they can perform on those objects. The ability to access an object is called authority. When you set up object authority, you need to be careful to give your users enough authority to do their work without giving them the authority to browse and change the system. Object authority gives permissions to the user for a specific object and can specify what the user is allowed to do with the object. You can limit an object resource through specific detailed user authorities, such as adding records or changing records. System resources can be used to give the user access to specific system-defined subsets of authorities: *ALL, *CHANGE, *USE, and *EXCLUDE.

Files, programs, libraries, and directories are the most common system objects that require resource security protection, but you can specify authority for each object on the system.

Related concepts

Planning resource security
This topic describes each of the components of resource security and how they all work together to protect information on your system. It also explains how to use CL commands and displays to set up resource security on your system.

Implementing resource security
This information helps you establish resource security for workstations and printers by setting ownership and public authority to objects, as well as specific authority to applications.

System security tools

You can use security tools to manage and monitor the security environment on your system.

The security tools are part of IBM i. They consist of a set of commands and programs that you manage through two main menus:

- The Security Tools (SECTOOLS) menu allows you to run security commands interactively.
- The Submit or Schedule Security Reports to Batch (SECBATCH) menu allows you to run security report commands in batch mode.

You can use these security tools to work with user profiles, control security auditing, print security reports, and customize your system security. For example, you can use security user profile tools to help you do the following actions:

- Find out what user profiles have default passwords.
- Schedule user profiles to be unavailable at certain times of the day or week.
- Schedule a user profile to be removed when the employee leaves.
- Find out which user profiles have special authorities.
- Find out who adopts authority to objects on the system.

You can use the object security tools to track the public and private authorities that are associated with confidential objects. You can set these reports to print at regular intervals to help you focus your security efforts on current issues. You can also run reports to display only the changes since the last time you ran the report.

Other tools provide the ability to monitor:

- Trigger programs
- Security-relevant values in communications entries, subsystem descriptions, output queues, job queues, and job descriptions
- Altered or tampered programs

Related concepts

Configuring the system to use security tools
When you install IBM i operating system, the security tools are ready to use. The topics that follow provide suggestions for operating procedures with the security tools.

Related information

Commands and menus for security commands

Security audits

This topic describes the purpose of security audits.

People audit their system security for several reasons:

- To evaluate whether the security plan is complete.

- To make sure that the planned security controls are in place and working. This type of auditing is typically performed by the security officer as part of daily security administration. It is also performed, sometimes in greater detail, as part of a periodic security review by internal or external auditors.
- To make sure that system security is keeping pace with changes to the system environment. Some examples of changes that affect security are:
  - New objects created by system users
  - New users admitted to the system
  - New products installed
  - Object ownership changes that can require authorization changes
  - Responsibility changes that can cause users to move from group to group
  - Temporary authority that needs to be revoked in a timely manner
- To prepare for a future event, such as installing a new application, moving to a higher security level, or setting up a communications network.

The techniques described here are appropriate for all these situations. Which things you audit and how often depends on the size and security needs of your organization.

Security auditing involves using commands on your system and accessing log and journal information. You can create a special profile to be used by someone doing a security audit of your system. The auditor profile needs *AUDIT special authority to change the audit characteristics of the system. Some of the auditing tasks suggested in this chapter require a user profile with *ALLOBJ and *SECADM special authority. Set the password for the auditor profile to *NONE when the audit period has ended.

Related concepts
Planning security auditing
Use this information to plan security auditing for your systems.

Types of authority

This topic discusses the types of authority that can be authorized and used on the server.

Your system provides different types of authorities for users. **Authority** means the type of access allowed to an object. Different operations require different types of authority. For example, you might have the authority to view information or to change information about the system. The system provides several different authority types. IBM groups these authority types into categories, called **system-defined authorities** and **special authorities**.

System-defined authority to an object is divided into three categories:

Object Authority
   Defines what operations can be performed on the object as a whole.

Data Authority
   Defines what operations can be performed on the contents of the object.

Field Authority
   defines what operations can be performed on the data fields.

Special authority is used to specify the types of actions that a user can perform on system resources. A user can be given one or more special authorities. The system security level determines what the default special authorities are for each user class. When you create a user profile, you can select special authorities based on the user class. Special authorities are also added and removed from user profiles when you change security levels.

For more information about setting up resource authority, see "How the system checks authority" in Chapter 5 of the *IBM i Security reference*.

System-defined authorities

Your system was shipped with several system-defined authorities: *USE, *CHANGE, *ALL, and *EXCLUDE. These authorities apply to securing files, programs, and libraries.

Use this information to plan system-defined authorities. To design simple resource security, try to plan security for entire libraries. The table shows how system-defined authorities apply to securing files, programs, and libraries:

Table 2. System-defined authorities				
	***USE authority**	***CHANGE authority**	***ALL authority**	***EXCLUDE[1] authority**
Operations allowed for files	View information in the file.	View, change, and delete records in the file.	Create and delete the file. Add, change, and delete records in the file. Authorize others to use the file.	None.
Operations not allowed for files	Change or delete any information in the file. Delete the file.	Delete or clear the entire file.	None.	Any access to the file.
Operations allowed for programs	Run the program.	Change the description of the program.	Create, change, and delete the program. Authorize others to use the program.	None.
Operations not allowed for programs	Change or delete the program.	Change or delete the program.	Change the owner of the program, if the program adopts authority.	Any access to the program.
Operations allowed for libraries	• For objects in the library, any operation allowed by the authority to the specific object. • For the library, view descriptive information.	• For objects in the library, any operation allowed by the authority to the specific object. • Add new objects to the library. • Change the library description.	• Everything allowed with change authority. • Delete the library. • Authorize others to the library.	None.
Operations not allowed for libraries	• Add new objects to the library. • Change the library description. • Delete the library.	Delete the library.	None.	Any access to the library.
1 *EXCLUDE overrides any authorities that you grant to the public or through a group profile.				

Related concepts

Setting up specific authority for objects and libraries
You can use the Edit Object Authority (EDTOBJAUT) command to set specific authority for the library and objects in the library.

Understanding how object authority and library authority work together

You need to understand how library and object authority work together in order to create your system security plan.

The table below gives examples of authorities that are required for both an object and the library:

Table 3. How library authority and object authority work together

Object type	Operations	Object authority needed	Library authority needed
File	Change data	*CHANGE	*EXECUTE
File	Delete the file	*OBJOPR, *OBJEXIST	*EXECUTE
File	Create the file	None.	*EXECUTE, *ADD
Program	Run the program	*USE	*EXECUTE, *OBJOPR
Program	Recompile the program	*OBJEXIST, *OBJMGR, *READ	*ADD, *READ
Program	Delete the program	*OBJEXIST	*EXECUTE

Special authorities

Several special authorities can be specified for a user. When you create a user profile, you can select special authorities based on the user class.

The system security level determines what the default special authorities are for each user class. Special authorities are also added and removed from user profiles when you change security levels.

You can specify these special authorities for a user:

*ALLOBJ
   All-object special authority allows a user authority to perform all operations on objects.

*AUDIT
   Audit special authority allows a user to define the auditing characteristics of the system, objects, and system users.

*IOSYSCFG
   System configuration special authority allows a user to configure communication, and input and output devices on the system.

*JOBCTL
   Job control special authority allows a user to control batch jobs and printing on the system.

*SAVSYS
   Save system special authority allows a user to save and restore objects.

*SECADM
   Security administrator special authority allows a user to work with user profiles on the system.

*SERVICE
   Service special authority allows a user to perform software service functions on the system.

*SPLCTL
   Spool control special authority allows unrestricted control of batch jobs and output queues on the system.

For more information about special authorities, see "Using System Security (QSecurity) System Value" in the *IBM i Security Reference*.

Related concepts

Monitoring special authorities

Special authority is a type of authority a user can have to perform system functions, including all object authority, save system authority, job control authority, security administrator authority, spool control authority, service authority, and system configuration authority. SECBATCH menu options and commands are used to monitor special authorities.

Intrusion detection

Intrusion detection involves gathering information about unauthorized access attempts and attacks coming in via the TCP/IP network. Your overall security policy will have a section devoted to intrusion detection.

The term *intrusion detection* is used two ways in IBM i documentation. In the first sense, intrusion detection refers to the prevention and detection of security exposures. For example, a hacker might be trying to break into the system using an invalid user ID, or an inexperienced user with too much authority might be altering important objects in system libraries.

In the second sense, intrusion detection refers to the new intrusion detection function that uses policies to monitor suspicious traffic on the system. You can create an intrusion detection policy that audits suspicious intrusion events that come in through the TCP/IP network.

Related information

Intrusion detection

Planning your security strategy

A security strategy provides a systematic approach to all the planning tasks that are necessary for implementing your company's security policy.

Once you have defined your company's security values within your security policy, you can begin developing your security strategy. To best complete this goal, you need to start at the most basic security need and then work to more specific security issues.

For example, the suggested approach that this information takes is to begin with planning physical security of your hardware and information assets and then to plan specific security for your system, users, resources, and network. As you develop your security strategy, begin at the most general security concerns and then move toward other more specific security goals. Each planning step is arranged to be completed in order.

Using system values to customize your system

The system uses system values and network attributes to control many things other than security. System and application programmers use most of these system values and attributes. Your security officer should set a few system values and network attributes to customize your system.

Assigning a name to your system

You use the SYSNAME network attribute to assign a name to your system. The system name appears in the upper-right corner of your sign-on display and on system reports. It is also used when your system communicates with another system or with personal computers.

When your system communicates with other systems or personal computers, the system name identifies and distinguishes your system from others on the network. Computers exchange system names whenever they communicate. Once you assign a system name, you should not change it, because changing it affects other systems in your network.

Choose a meaningful and unique name for your system. Even if you are not communicating with other computers today, you may in the future. If your system is part of a network, the network manager will probably tell you what system name to use.

Choosing the date display format for your system

You can set the sequence in which year, month, and day appear when your system prints or displays the date. You can also specify what character the system should use between the year (Y), month (M), and day (D). The system value QDATFMT determines the date format. The date and time format chart shows how the system prints the date, 16 June 2000, for each possible choice.

Table 4. Date and time formats		
Your choice	**Description**	**Result**
YMD	Year, Month, Day	00/06/16
MDY	Month, Day, Year	06/16/00
DMY	Day, Month, Year	16/06/00
JUL	Julian Date	00/168

Note: These examples use the slash (/) date separator.

The system value QDATSEP determines what character the system uses between year, month, and day. The date separator characters table shows your choices. You use a number to specify your choice.

Table 5. Date separator characters		
Separator character	**QDATSEP value**	**Result**
/ (slash)	1	16/06/00
- (hyphen)	2	16-06-00
. (period)	3	16.06.00
, (comma)	4	16,06,00
(blank)	5	16 06 00

Note: The above examples use the DMY format.

Setting the time display format for your system

The QTIMSEP system value determines what character the system uses to separate hours, minutes, and seconds when it shows the time. You use a number to specify your choice. The time separator characters table shows how the time of 10:30 in the morning is formatted using each value:

Table 6. Time separator characters		
Separator character	**QTIMSEP**	**Result**
: (colon)	1	10:30:00
. (period)	2	10.30.00
, (comma)	3	10,30,00
(blank)	4	10 30 00

Deciding how to name your system devices

Your system automatically configures any new display stations and printers you attach to it. The system gives a name to each new device. The QDEVNAMING system value determines how the names are assigned. The system device names chart shows how the system names the third display station and the second printer attached to your system:

Table 7. System device names			
Your choice	**Naming format**	**Display station name**	**Printer name**
1	IBM i	DSP03	PRT02
2	S/36	W3	P2
3	Address of the device	DSP010003	PRT010002

Note: In the above example, the display station and printer are attached to the first cable.

Recommendations

Use naming conventions not device addresses, unless you are running software which requires S/36 naming. Names for display stations and printers are less cumbersome than names which use the address of the device. Display station and printer names appear on several Operational Assistant displays. Printer names are also used to manage printer output.

After the system has configured a new device, use the Change Display Device (CHGDEVDSP) command or the Change Printer Device (CHGDEVPRT) command to enter a meaningful description of the device. Include in the description both the physical address of the device and its location, such as John Smith's office, line 1 address 6.

Choosing your system printer

Use the QPRTDEV system value to assign your system printer. QPRTDEV, the user profile, and the job description determine which printer a job uses. The job uses the system printer unless the user profile or the job description specifies a different one.

Recommendations

Normally, your system printer should be the fastest printer on your system. Use the system printer for long reports and system output.

Note: You will not know the names of your printers until you install and configure your system. Make a note about the location of your system printer now. Fill in the name of the printer later.

Allowing the display of completed printer output

The system provides users the ability to find their printer output. The Work with Printer Output display shows all the output that is currently printing or waiting to print. You can also allow users to look at a list of completed printer output.

The Work with Printer Output display shows when the output printed and on what printer it printed. This can be useful in locating lost reports. The job accounting function and the QACGLVL system value allow you to display completed printer output.

Storing completed printer output

The *PRINT option for the QACGLVL system value allows information about completed printer output to be saved. Storing information about completed printer output takes space on your system. Unless you think your users will print many reports, you probably do not need to provide this function. Enter NO on the System Values Selection form. This value sets the job accounting level to *NONE.

Before planning user groups

- Make sure you have written a security policy statement for your own company similar to the JKL Toy Company example that Sharon Jones and John Smith prepared.
- Make sure you have entered your choices for the system values on the System Values Selection form.
- Make notes about what you would like to include in your security memo.

Developing a security policy

Your security policy defines what you want to protect and what you expect of your system users.

Each internet service that you use or provide poses risks to your system and the network to which it is connected. A **security policy** is a set of rules that apply to activities for the computer and communications resources that belong to an organization. These rules include areas such as physical security, personnel security, administrative security, and network security. It provides a basis for security planning when you design new applications or expand your current network. It describes user responsibilities, such as protecting confidential information and rules for creating passwords.

Your security policy should also describe how you will monitor the effectiveness of your security measures. Such monitoring helps you to determine whether someone might be attempting to circumvent your safeguards. To develop your security policy, you must clearly define your security objectives. Once you create a security policy, you must take steps to put into effect the rules that it contains.

You might find it useful to send security guidelines to all of your employees to emphasize your security policies regarding physical and system security. In these guidelines, you should include instructions about how to protect system security, such as signing off workstations, using passwords appropriately, and protecting the network from unauthorized intruders. The security policy can also explain the procedure for training employees and installing necessary software and hardware to ensure system security.

Remember that you can always change your security policy. When you make changes in your computing environment, you should update your security policy to address any new risks that these changes impose. Most companies find they need more strict security as they grow.

Performing the following steps to develop a security policy

1. Talk with other members of your organization, such as security auditors, to better determine your security needs.
2. Examine the technologies that you use in your company. For example, if your system is connected to the Internet, you will want a more restrictive security environment to protect your system from outside Internet users.
3. Determine your overall approach to security, as follows:

   Strict
   A strict policy is a need-to-know security scheme. In a strict security environment, you give users access only to the information and functions that they need to do their jobs. All others are excluded. Many auditors recommend the strict approach.

   Average
   An average security policy gives users access to objects, based on the authorities that you have assigned them.

   Relaxed
   In a relaxed security environment, you allow authorized users access to most objects on the system. You restrict access only to confidential information. A single department or small company might use the relaxed approach on their systems.
4. Determine what information assets require protection. To assist with this determination, consider confidentiality, competitiveness, and operations:

   Confidentiality
   Information that is not generally available to people in your company. Payroll is an example of confidential information. Another example of confidential information is new technical information that has not yet been announced to the public.

   Competitiveness
   Information that gives you an advantage over your competition, such as product specifications, formulas, and pricing guidelines.

   Operations
   Information about your computer that is essential for the daily operations of your business, such as customer records and inventory balances.

5. Create a statement of company policy regarding security. This is an agreement between you and the top officials in the company. Your security policy should state what your overall approach is and what assets require protection. "Example of a security policy" on page 23

6. Create a draft of your security policy. "Example: Company security memo" on page 23

7. As you work through the planning process, take additional notes that you will use to complete the security policy.

8. Complete the security policy and distribute it to the employees in your company. Use it as you carry out and monitor the security on the system.

After you have created a security policy, you can choose your "Security levels" on page 6 on the system.

Example of a security policy

Overall Approach

Relaxed: Most people need access to most information.

Critical Information

• Contracts and special pricing
• Payroll (Only Accounting can set and change credit limits for customers.)
• Customer and inventory records

General Rules

• Every system user has a user profile.
• Users must change their password every 60 days.
• Users must use the latest security patches.

Figure 1. Company Security Policy

Example: Company security memo

Security of the New System

You have all attended an information meeting about our new system. Those who will use the system have started training and will begin processing customer orders next week. Observe the following security guidelines when working on your system:

• Everyone who needs to use the system will receive a user ID and a password. You will be required to change your password the first time you sign on the system and every 90 days after that. Passwords must be 8 characters in length and contain a combination of letters and numbers. Passwords must not contain your name, userid, or other personal information.

• Do not share your password with anyone. If you forget your password, go to the technical support web site for instructions on resetting your password.

• Lock your system using the screen-saver password when you are away from your desk.

• Lock up confidential information when you go home for the day. Examples of confidential information include contract and special pricing information, and payroll records.

Figure 2. Company Security Memo

Related concepts

Security levels

Security on your system is arranged in a series of levels, with each level offering a greater degree of security and protection of your data than the previous level.

Changing a security policy

You can use IBM Navigator for i to view and manage policies for your system.

The following system values can be used to manage these policy areas:

Auditing
    This allows you to set up monitoring for specific actions and access to specific resources on your system.

Security
    This allows you to specify the level of security and additional options that relate to system security.

Password
    This allows you to specify password level security for the system.

Save and Restore
    This allows you to specify how certain objects are restored on the system.

Signon
    This allows you to specify how users can sign onto the system.

1. From IBM Navigator for i, expand **Configuration and Service**.
2. Click **System Values**.
3. To change a system value, right-click the system value and select **Properties**.

Planning physical security

Physical security includes the protection of your server from accidental (or intentional) damage and theft. In addition to your server, it includes all of your workstations, printers, and storage media.

When you prepare to install your server, you should create a physical security plan by asking these questions:

- Where will you put the system unit?
- Where will you locate each display station?
- Where will you locate printers?
- What additional equipment do you need, such as wiring, telephone lines, furniture, or storage areas?
- What measures will you take to protect your system from emergencies such as fire or power interruptions?

Physical security should be part of your overall security planning. You might need special measures to protect them depending on where you put the system and its devices.

You can use the "<u>"Physical security planning worksheet" on page 28</u>" to record your decisions about the physical security of your system.

Planning physical security for the system unit

Decisions need to be made in order to secure certain aspects of the system unit, such as the physical location, the control panel, and the Service Tools user ID and password.

Your system unit represents an important business asset and potential door into your system. Some system components inside the system are both small and valuable. You should place the system unit in a controlled location to prevent someone from stealing it or from removing valuable system components or from using the control panel. The best location is in a private, locked room. The system unit should be in a place that can be locked before and after regular business hours.

Each system unit has a control panel that provides the ability to perform basic functions without a workstation. For example, you can use the control panel to do the following actions:

- Stop the system.
- Start the system.
- Load the operating system.
- Start service functions.

All of these activities can disrupt your system users. They also represent potential security exposures to your system.

Risks to the system unit

In addition to theft of the system unit or its components, here are some other risks posed by inadequate physical security of your system unit:

Unintentional disruption of system operations
Many security problems come from authorized system users. Suppose that one of the display stations on your system gets locked up. The system operator is away at a meeting. The frustrated display station user walks over to the system unit, thinking that, "Maybe if I press this button, it will correct things." That button might turn off or reload the system while many jobs are running. You might need several hours to recover partially updated files.

Use of dedicated service tools (DST) function to circumvent security
Security does not control service functions the system performs, because your system software might not be operating properly when you need to perform these functions. A knowledgeable person who knows or guesses the service tools user ID and password can cause considerable damage to your system.

What to do to keep your system secure

There are several ways to keep your system unit secure. Record your choices on the System Unit section of the Physical Security Planning worksheet.

- Ideally, keep your system unit in a locked room. If your unit is in an unlocked room, place it where outsiders cannot access it. In addition, choose a location where responsible employees can monitor it. The following physical security features can help you protect your system from accidental or intentional tampering:
- Change the Dedicated Service Tools (DST) user ID and password immediately after you install your system and after service personnel use it.

Example: Physical security planning worksheet: System unit

Table 8. Physical security planning worksheet: System unit	
System unit	
Describe your security measures to protect the system unit (such as a locked room).	The system unit is in the accounting area. During the day, accounting people are always in the area and can watch the system unit. Before and after regular business hours, the area is locked.
Other comments relating to the system unit.	The system unit is easily accessible. The people in the accounting area should ensure that unauthorized people do not tamper with the unit.

Related information
Configure service tools user IDs

Planning physical security for system documentation and storage media

The importance of securing important system documentation and storage media cannot be underemphasized. When the time comes that you need to rebuild your system, the duplicates of your system documentation and backup media will make rebuilding your system possible.

System documentation includes information that IBM sends with the system, password information, your planning forms, and any reports that the system generates. Depending on your system, backup media can include tapes, CD-ROMs, diskettes, or DVD storage. You should store both system documentation and backup media at your business location as well as at another remote location. In case of a disaster, you will need this information to recover your system.

Storing system documentation securely

Service tools and security officer passwords are critical to the operation of your system. You should write these passwords down and store them in a safe, confidential location. In addition, keep a copy of these passwords at an offsite location to help you recover from a disaster.

Consider storing other important system documentation, such configuration settings and your main application libraries, away from your business location to help you recover from a disaster.

Storing your storage media securely

When you install your system, make plans for regularly saving all the information on the system to tape or other storage media. These backups allow you to recover your system if necessary. You should keep these backups in a secure location offsite as well.

Risks related to backup media and password information

- Damage to backup media: If a disaster or vandals destroyed your system backup media, you cannot recover the information that was on your system, except from printed reports.
- Theft of backup media or passwords: You may have confidential business information saved on your backup media. A knowledgeable person might be able to restore this information to another computer and print or process it.

What to do to keep your storage media and passwords secure

The following information suggests ways to store your system documentation and storage media. After you have decided on your method, record your choices on the Backup Media and Documentation section of the Physical Security Planning worksheet:

- Store all passwords and backup media in a locked, fireproof cabinet.
- Take copies of your backup media to a secure, offsite location on a regular basis, for example, at least weekly.
- Consider using tape hardware that is capable of encrypting the data on your tape media. This provides protection of the data in the event the media is lost or stolen.

Example: Physical security planning form—backup media and documentation

Table 9. Physical Security Planning Form: Backup Media and Documentation	
Backup Media and Documentation	
Where are backup tapes stored at your business location?	In a fireproof safe.
Where are backup tapes stored away from your business location?	In a fireproof safe at the office of our company's accountant.
Where are the security officer, service, and DST passwords kept?	In the manager's office.
Where is important system documentation, such as the serial number and the configuration, kept?	In a fireproof safe at the office of our company's accountant.

After you plan your storage and documentation security, you can plan physical security for your workstations.

Planning physical workstation security

There are many security risks and recommendations for workstations that you need to be aware of when planning your security system.

You might want all users to be able to sign on at any available workstation and perform all authorized functions. However, if you have workstations that are either very public or very private, you might want to ensure that unauthorized users do not access functions on those workstations.

Risks associated with workstations

Using a workstation in a public location for unauthorized purposes
> If people outside your company can easily access locations, they might potentially see confidential information. If a system user leaves a workstation signed on, someone from outside the company might be able to walk up and access confidential information.

Using a workstation in a private location for unauthorized purposes
> A workstation located in a private location gives an intruder the opportunity to spend long hours trying to circumvent your security without being observed.

Using the playback function or a PC sign-on program on a display station to circumvent security measures
> Many display stations have a record and playback function, that allows users to store frequently used keystrokes and repeat them by pressing a single key. When you use a personal computer as a workstation on the system, you can write a program to automate the sign-on process. Because users frequently use the sign-on process , they might decide to store their user IDs and passwords, rather than typing them every time they sign on.

What to do to keep your workstation secure

You need to identify which workstations might pose a security risk. The following information suggests ways to keep your workstation secure. Record your choices on the Workstations and Printers section of the Physical Security Planning worksheet.

- Avoid placing workstations in very public or private locations.

- Remind users that recording a password in a display station or in a PC program violates system security.

- Require users to sign off before leaving a workstation.

- Take measures, such as using the inactive timer system values (QINACTITV and QINACTMSCQ), to prevent users from leaving workstations in public locations without signing off the system.

- Restrict access to vulnerable workstations:

  - Permit only user profiles with limited function.

  - Prevent people with security officer or service authority from signing on at every workstation using the QLMTSECOFR system value.

  - Restrict users from signing on at more than one workstation at the same time using the QLMTDEVSSN system value.

- Restrict *CHANGE authority to printers and other devices.

Example: Physical security planning worksheet: Workstations and printers

Table 10. Physical security planning worksheet: Workstations and printers			
Workstations and printers			
Workstation or printer name	Its location or description	Security exposure	Protective measures to be taken

Table 10. Physical security planning worksheet: Workstations and printers (continued)			
Workstations and printers			
DSP06	Loading docks	Too public	Automatic signoff. Limit functions that can be completed at the workstation.
RMT12	Remote sales office	Too private	Do not let security officer sign on there.
PRT01	Accounting office	Confidential information, such as price lists, could be seen.	Place printer in a locked room. Remind users to pick up confidential output within 30 minutes.

Planning physical security for printers and printer output

The risks and recommendations for securing printers and printer output need to be incorporated into your security plan.

Once information starts printing, system security cannot control who sees it. To minimize the threat of someone seeing sensitive business information, you should secure printers and printer output. You should also create a policy that deals with printing confidential business information.

Risks associated with printers and printer output

When you plan security for printers, keep the following risks in mind:

- *Printer location*. A printer located in a public place might give unauthorized people access to confidential information.
- *Printer output*. Printer output left lying on a desk might reveal information.
- *Confidential printer output*. Employees might be printing out confidential information such as paychecks or product specifications.

What to do to keep printers and output secure

The following recommendations can help you diminish security risks that are associated with printers and their output:

- Emphasize to system users the importance of protecting confidential printer output. Include plans for protecting printers and output in your security policy.
- Avoid locating printers in public places. Consider placing the printers in a locked room.
- Schedule the printing of highly confidential output and have an authorized person stay at the printer while it prints, or require employees to pick up confidential output within a specific time interval.

Physical security planning worksheet

Use the physical security planning worksheet to plan physical security of the system unit, backup media, workstations, and printers.

Table 11. Physical security planning worksheet	
Physical security planning worksheet	**Part 1 of 2**
Prepared by:	Date:

Table 11. Physical security planning worksheet (continued)	
Physical security planning worksheet	**Part 1 of 2**
Instructions	
• Learn about this worksheet in the "Plan Physical Security" topics. • Use this worksheet to describe any security issues that are related to the physical location of your system unit and attached devices. • You do not need to enter the information on this worksheet into the system.	
System unit:	
Describe your security measures to protect the system unit (such as a locked room).	
Other comments relating to the system unit:	
Backup media and documentation:	
Where are backup tapes stored at your business location?	
Where are backup tapes stored away from your business location?	
Where are the security officer, service, and DST passwords kept?	
Where is important system documentation, such as the serial number and the configuration, kept?	
What media should be encrypted using tape hardware?	

Physical Security Planning worksheet			**Part 2 of 2**
Additional instructions for Part 2			
• List below any workstations or printers whose location might cause security exposures. Indicate what protective measures you will take. For a printer, list examples of confidential printed reports under the Security Exposure column. • If you allow the system to automatically configure your local devices, you may not know the names of workstations and printers until after your system is installed. If you do not know the names when you prepare this worksheet, fill in the descriptions (such as location) and add names later.			
Physical security of workstations and printers:			
Workstation or printer name	Its location or description	Security exposure	Protective measures to be taken

Related concepts

Planning user security

Planning user security includes planning all areas where security affects the users on your system.

Planning system security

System security entails controlling user access and their privileges, maintaining information integrity, monitoring processes and access, auditing system functions, and providing backup and recovery of security related information.

On the IBM i, system security is integrated into the operating system through use of system values. System values control how a given function will perform based on how the value is defined. Security system values are categorized based on the functions that they perform. For example, security system values can manage the level of security on your system and sign-on and password controls.

Using security system values require that a user or administrator have the appropriate authority to change and update these values. In some cases, the authorities for these security values are different. For each security system value described in these sections the necessary authority is provided.

Security system values can be set through the IBM i character-based interface or through IBM Navigator for i, a graphical interface which provides easy management of most IBM i functions. This information provides names of system values for both IBM Navigator for i and its equivalent in the character-based interface.

In addition this topic provides descriptions of these security system values, recommendations for common installations, and a form to record your system value decisions.

To complete system security planning, review these topics on security-related system values and record your choices on the System values selection worksheet.

General security system values
  This topic introduces the general system values that you can use to control security on your IBM i operating system.

System values that apply to passwords
  This topic describes the system values that apply to passwords. These system values require users to change passwords regularly and help prevent users from assigning trivial, easily guessed passwords. They can also make sure passwords meet the requirements of your communications network.

System values that control auditing
  Auditing system activity is an important part of system security, as it can help detect system misuse and intrusions. You can use specific systems values to control auditing on the IBM i operating system.

Security-related restore system values
  This topic introduces the security-related restore system values on your IBM i operating system.

Related concepts
Security levels
Security on your system is arranged in a series of levels, with each level offering a greater degree of security and protection of your data than the previous level.

Related reference
System values selection worksheet
This topic introduces the System Values Selection worksheet.

System values selection worksheet

This topic introduces the System Values Selection worksheet.

Table 12. System Values Selection worksheet			
General security system values			
Prepared by:		Date:	
System Value	**Recommended value**	**Your choice**	

Table 12. System Values Selection worksheet (continued)			
General security system values			
System name			
Date separator (QDATSEP)			
Date format (QDATFMT)			
QSCANFS			
QSCANFSCTL			
Time separator (QTIMSEP)			
Device naming format for new devices (QDEVNAMING)	1 (system)		
System printer (QPRTDEV)			
Security level (QSECURITY)	40		
Allow security officers to sign on to any display station (QLMTSECOFR)	N		
Save job accounting information about completed printer output (QACGLVL)	N (*NONE)		

System Values Selection worksheet	Part 2 of 2
Additional instructions for Part 2	
• Use the Work With System Value (WRKSYSVAL) command to enter Part 2.	

Security system values		
System value	**Recommended choice**	**Your choice**
Inactive job time-out interval (QINACTITV)	30 to 60	
Inactive job message queue (QINACTMSGQ)	*DSCJOB	
Limit device sessions (QLMTDEVSSN)	1 (YES)	
Action to take for failed sign-on attempts (QMAXSGNACN)	3 (Disable both)	
Maximum sign-on attempts allowed (QMAXSIGN)	3 to 5	
Password expiration interval (QPWDEXPITV)	30 to 60	
Maximum password length (QPWDMAXLEN)	8	

System Values Selection worksheet		Part 2 of 2
Minimum password length (QPWDMINLEN)	7	
Require different passwords (QPWDRQDDIF)	7 (6 unique passwords)	
Other system values		
System value	**Recommended choice**	**Your choice**
Disconnected job time-out interval (QDSCJOBITV)	300	
Note: You may want to set some other security-related system values.		

Related concepts

Planning system security

System security entails controlling user access and their privileges, maintaining information integrity, monitoring processes and access, auditing system functions, and providing backup and recovery of security related information.

Related information

Security-related system values

Planning user security

Planning user security includes planning all areas where security affects the users on your system.

When you plan user security, it is essential that you describe:

User group security

A user group is a group of users who need to use the same applications in the same way. Planning user group security involves determining the workgroups who plan to use the system and the application needs of those groups.

Individual user security

Individual user profiles contain security-related information for each user on the system. Your individual user security planning will determine how the user signs on to the system, what the user is allowed to do after signing on, and how the user's actions are audited.

You might find these planning forms helpful when planning user group and individual user security:

- Use the Physical security planning worksheet to describe any security issues that are related to the physical location of your system unit and attached devices.
- Use the User group identification worksheet to identify groups of users who have similar application needs.
- Use the User group description worksheet to describe the characteristics of each user group.
- Use the System responsibilities worksheet to create a list of everyone that has access to your system that has a user class other than *USER.
- Create group profiles by filling out a User profile worksheet for each user group that is on your system, recording information about individual system users.

Related concepts

User security

From a user's point of view, security affects how they use and complete tasks on the system.

Related reference

Physical security planning worksheet

Use the physical security planning worksheet to plan physical security of the system unit, backup media, workstations, and printers.

User group identification worksheet
You will need to complete a user group identification worksheet as part of your user group and application security.

User group description worksheet
You will need to complete a user group description worksheet for each user group you create.

System responsibilities worksheet
You will complete the system responsibilities worksheet by naming your security officers.

User profile worksheet
The individual user profile worksheet needs to be completed for each user group so the group's profile is recorded in your security plan.

Planning user groups

The first step in the planning process, deciding your security strategy, was like setting company policy. Now you are ready to plan for groups of users, which is like deciding department policy.

What is a user group? A user group is exactly what its name implies: a group of people who need to use the same applications in the same way. Typically, a user group consists of people who work in the same department and have similar job responsibilities. You define a user group by creating a group profile.

What does a group profile do? A group profile serves two purposes on the system:

- **Security tool:** A group profile provides a simple way to organize who can use certain objects on your system, your users' and groups' object authorities. You can define object authorities for an entire group rather than for each individual member of the group.
- **Customizing tool:** You can use a group profile as a pattern for creating individual user profiles. Most people who are part of the same group have the same customizing needs, such as the initial menu and the default printer. You can define these in the group profile and copy them to the individual user profiles.

Group profiles make it easier for you to maintain a simple, consistent scheme for both security and customizing.

Forms you need to plan a user group

- Complete a "User group identification worksheet" on page 37 to identify the groups of users on your system that have similar application needs.
- Complete a "User group description worksheet" on page 38 for each group that uses your system.

To complete these forms, you will need to:

1. Identify user groups
2. Plan group profiles
3. Set the system values that affect sign-on
4. Set the system values that limit what a user can do
5. Set the system values that determine the user's environment

Identifying user groups
Identifying your user groups allows you to plan accesses to resources that these groups need.

Try using a simple method to identify your user groups. Think about the departments or workgroups who plan to use the system. See if a natural relationship exists between work groups and applications:

- Can you identify a primary application for each work group?
- Do you know which applications each group needs? Which applications they do not need?

- Do you know which group should own the information in each application library?

If you can answer "Yes" to those questions, then you can begin to plan your user groups. However, if you answered "sometimes" or "maybe", then you might find it helpful to use a systematic approach to identify your user groups.

Note: Making users a member of only one group profile simplifies your security management. However, some situations can benefit from having users belong to more than one group profile. Having users belong to more than one group profile is usually easier to manage than giving many private authorities to individual user profiles.

Decide what your user groups should be. Fill in the User Group Identification form, if you need it to help you decide. After you add your users to the User Group Identification form, you can plan a group profile.

Example: Identifying user groups

In this example, different groups need the Pricing and Contract application:

- The Sales and Marketing department sets prices and creating customer contracts. They own the pricing and contract information.
- The customer order department changes contract information indirectly. When they process orders, the quantities on the contract change. They need to change pricing and contract information.
- The order processing people need to look at the credit limit information to plan their work, but they are not allowed to change it. They need to view the credit limit file.

Table 13. Example: User Group Identification Form

User Group Identification Form

		Access Needed for Applications			
User Name	**Department**	**APP:** A	**APP:** B	**APP:** C	**APP:** D
Ken H.	Order processing	O	C	C	C
Karen R.	Order processing	O	C	C	C
Kris T.	Accounting	V		V	O
Sandy J.	Accounting	V	C	V	O
Peter D.	Accounting	C		V	O
Ray W.	Warehouse	V	O	V	
Rose Q.	Warehouse	V	O	V	
Roger T.	Sales and marketing	C	C	O	C
Sharon J.	Management	C	C	C	C

Note:

- Use a V (view) if someone only needs to look at the information in the application.
- Use a C (change) if someone needs to make changes to the information.
- Use an O (owner) if someone has primary responsibility for the information.

Planning group profiles

Use group profiles are to define authorities for a group of users, rather than giving authority to each user individually.

A user can be a member of up to 16 group profiles. You can use a group profile as a pattern for creating individual user profiles.

Once you identify your user groups, you are ready to plan a profile for each group. Many of the decisions you make affect both security and customizing. For example, when you specify an initial menu, you might be restricting a user to only that menu. But you are also ensuring that the user sees the correct menu after signing on.

A group profile is a special type of user profile. For example:

1. Create a profile called GRPIC: CRTUSRPRF GRPIC
2. When the profile is created, it is an ordinary profile, not a group profile.
3. Designate GRPIC as the group profile for another group profile: CHGUSRPRF USERA GRPPRF(GRPIC)
4. The system now treats GRPIC as a group profile and assigns a *gid* to it.

Related concepts
Group profiles
A *group profile* is a special type of user profile that provides the same authority to a group of users.

Related information
Security system values

Creating a group profile plan
Group profiles are created the same way user profiles are created. Group profiles make security planning less complicated by allowing object authorities to be assigned to a group of users rather than each individual user.

The system recognizes a group profile when you add the first member to it. At that point, the system sets information in the profile indicating that it is a group profile. The system also generates a group identification number (*gid*) for the profile. You can also designate a profile as a group profile at the time that you create it by specifying a value in the GID parameter.

1. Prepare a user group description worksheet for each identified group.
2. Name groups consistently.
3. Use the naming conventions worksheet to document your group naming conventions.
4. Determine the application and library needs of each user group. Use the application descriptions worksheet and library description worksheet.
5. Define the job description for user groups.

Planning primary groups for objects

Any object on the system can have a primary group. Primary group authority can provide a performance advantage if the primary group is the first group for most users of an object. Often, one group of users is responsible for some information about the system, such as customer information. That group needs more authority to the information than other system users. By using primary group authority, you can set up this type of authority scheme without affecting the performance of authority checking.

Planning multiple group profiles

A user can be a member of up to 16 groups: the first group (GRPPRF parameter in the user profile) and 15 supplemental groups (SUPGRPPRF parameter in the user profile). By using group profiles, you can manage authority more efficiently and reduce the number of individual private authorities for objects. However, the misuse of group profiles can have a negative effect on the performance of authority checking.

When using multiple group profiles:

- Try to use multiple groups in combination with primary group authority and eliminate private authority to objects.
- Carefully plan the sequence in which group profiles are assigned to a user. The user's first group should relate to the user's primary assignment and the objects used most often. For example, assume a user called WAGNERB does inventory work regularly and does order entry work occasionally. The profile needed for inventory authority (DPTIC) should be WAGNERB's first group. The profile needed for order

entry work (DPTOE) should be WAGNERB's first supplemental group. The sequence in which private authorities are specified for an object has no effect on authority checking performance.

- If you plan to use multiple groups, be sure you understand how using multiple groups in combination with other authority techniques, such as authorization lists, may affect your system performance.

Related information
Security system values

Preparing a user description worksheet
Here is an example of how to prepare a user description worksheet.

In this example, the User group description worksheet includes the group profile name, the applications, and the libraries that the group uses.

Table 14. Example: User Group Description Worksheet
User Group Description Worksheet
Group profile name: DPTWH Description of the group: `Warehouse department`
Primary application for the group: `Inventory control` List other applications needed by the group: None
List each library that the group needs. Place an X in front of each library that should be in the initial library list for each group. • **X** ITEMLIB • **X** ICPGMLIB

Related information
Security system values

Naming group profiles
Because a group profile acts as a special type of user profile, you may want to identify group profiles on lists and displays. You need to assign them special names.

To appear together on lists, your group profiles should begin with the same characters, such as GRP (for group) or DPT (for department). Use these guidelines when naming user groups:

- User group names can be up to 10 characters long.
- The name may include letters, numbers, and the special characters: pound (#), dollar ($), underline (_), and the at sign (@).
- The name cannot begin with a number.

Note: For each group profile, the system assigns a group identification number (*gid*). Normally, you can let the system generate a *gid*. If you use your system in a network, you may need to assign specific *gid*s to group profiles. Check with your network administrator to verify whether you need to assign IDs.

Drawing an application diagram
At this point in your planning process, you may find it useful to draw a diagram showing the relationship between applications and libraries. Your diagram will help you to plan both user groups and resource security.

Collecting some information about your applications and libraries now will help you with many security decisions you need to make. Look at this as a chance to become more knowledgeable about your system and applications.

To ensure that you have gathered the application information that you need, you should:

- Complete an Application description form for each business application on your system.

- Prepare an Application description form for each special application on your system.
- Fill in the library and file sections of the Naming conventions form.
- Prepare a Library description form for each application library.
- Draw a diagram of the relationship between your applications and libraries.

Determining the applications and libraries a user group needs
Draw an application diagram showing the relationships between your applications and libraries. This visual image will help you decide the resource and application needs of each group.

On Part 1 of the "User group description worksheet" on page 38, indicate the group's primary application, which is the application they use most often. List the other applications the group needs.

Look at your application description worksheet to see the libraries each group needs. Check with your programmer or application provider to find out the best method for providing access to these libraries. Most applications use one of these techniques:

- The application includes the libraries on a user's initial library list.
- The application runs a setup program which places the libraries in the user's library list.
- Libraries do not need to be in the library list. The application programs always specify the library.

The system uses a library list to find the files and programs you need when you run applications. The library list is a list of libraries the system searches for objects needed by the user. It has two parts:

1. **System portion:** Specified in the QSYSLIBL system value, the system portion is used for IBM i libraries. The default for this system value does not need to be changed.
2. **User portion:** The QUSRLIBL system value provides the user portion of the library list. The user's job description specifies the initial library list or commands, after the user is signed on. If you have an initial library list, it overrides the QUSRLIBL system value. Application libraries should be included in the user portion of the library list.

Defining the job description
When a user signs on the system, the user's job description defines many characteristics of the job, including how the job prints, how batch jobs are run, and the initial library list.

Your system comes with a job description, called QDFTJOBD, which you can use when creating group profiles. However, QDFTJOBD specifies the QUSRLIBL system value as the initial library list. If you want different groups of users to have access to different libraries when signing on, you should create unique job descriptions for each group.

List each library needed by the group on the User Group Description Form. If the library should be included on the initial library list in the group's job description, mark each library name on the form.

User group identification worksheet
You will need to complete a user group identification worksheet as part of your user group and application security.

Table 15. User group identification worksheet	
User Group Identification worksheet	
Prepared by:	Date:

Table 15. User group identification worksheet (continued)								
User Group Identification worksheet								
Instructions:								
• Learn about this worksheet in "Planning user groups".								
• This worksheet helps you identify groups of users who have similar application needs.								
1. List your major applications across the top of the worksheet.								
2. List your users in the left column.								
3. Mark needed applications for every user.								
• You do not need to enter the information on this worksheet into the system.								

		Access needed for applications						
User name	Department	APP:	APP:	APP:	APP:	APP:	APP:	APP:

Note:

• If you have a *relaxed* security environment, use an **X** to mark which applications users need.

• If you have a *strict* security environment, you may need to use **C** (change) and **V** (view) to specify *how* the applications are used.

Related concepts

Planning user security

Planning user security includes planning all areas where security affects the users on your system.

User group description worksheet

You will need to complete a user group description worksheet for each user group you create.

Table 16. User group description worksheet (part 1 of 2)	
User Group Description worksheet	**Part 1 of 2**
Prepared by:	Date:
Instructions for Part 1	
• Learn how to prepare this worksheet in "Planning user groups."	
• Learn how to enter this worksheet in "Setting up user security."	
• Prepare a separate worksheet for each group which will use the system.	
• Use the Create Job Description (CRTJOBD) command to create a job description for the group. The job description has the initial library list of the group.	
Group profile name: Description of the group:	
Primary application for the group: List other applications needed by the group:	
List each library the group needs. Mark **X** for each library that should be in the initial library list for the group:	

Table 16. User group description worksheet (part 1 of 2) (continued)	
User Group Description worksheet	**Part 1 of 2**
Note: Look at the application description worksheet for each application that is listed in the previous section to find out which libraries that application uses.	

Table 17. User Group Description worksheet (part 2 of 2)	
User Group Description worksheet	**Part 2 of 2**
Additional instructions for Part 2	
• The tables below list all of the fields that appear on the Create User Profile display. The fields are divided into two groups: those where you need to make a choice and those where IBM recommends the default value. • Use the Work with User Profiles display or the Create User Profile (CRTUSRPRF) command to enter the information from this part of the form into your system.	

Choose values for these fields in the group profile:

Field Name	Recommended Choice	Your Choice
Group profile name (User)		
Password	*NONE	
User class (type of user)	*USER	
Current library (default library)	*same as group profile name*	
Initial program to call (sign on program)		
Initial program library		
Initial menu (first menu)		
Initial menu library		
Limit capabilities (restrict command line use)	*YES	
Text (user description)		
Job description	*same as group profile name*	
Job description library		
Group profile name (user group)	*NONE	
Print device (default printer)		
Output queue	*DEV	

Note: These fields are in the order in which they appear on the Create User Profile display (using F4).

Use the system-supplied values (defaults) for the fields below:

Accounting code	Keyboard buffering	Public authority
Assistance level	Language ID	Set password to expire
Attention program	Limit device sessions	Sort sequence
Coded character set ID	Maximum storage	Special authority
Country or Region ID	Message queue	Special environment

Table 17. User Group Description worksheet (part 2 of 2) (continued)		
User Group Description worksheet		**Part 2 of 2**
Display sign-on information	Password expiration interval	Status
Document password	Priority limit	User options
Note: The fields in this list are arranged in alphabetical order.		

Related concepts

Planning user security
Planning user security includes planning all areas where security affects the users on your system.

Planning user profiles

A user profile contains security-related information that controls how the user signs on the system, what the user is allowed to do after signing on, and how the user's actions are audited.

Now that you have decided on your overall security strategy and have planned user groups, you are ready to plan individual user profiles.

Things to consider when planning user profiles:

- Naming considerations for user profiles
- Responsibilities assigned to individual users
- Values for each user

Complete these worksheets to plan user profiles:

- Individual user profile worksheet
- System responsibilities worksheet

Refer to the copies of these worksheets you completed when planning for user profiles:

- "User group description worksheet" on page 38
- Naming conventions worksheet
- Application description worksheet

Related concepts

User profiles
Every system user must have a user identity before they can sign on to and use a system. This user identity is called a *user profile*.

Creating profiles for users in the group
This topic describes how to create profiles for individual users.

Creating profiles for users not in a group
Copy the first individual user profile to create additional members in the group. Look at each individual profile carefully when you create it with the copy method.

System responsibilities worksheet
You will complete the system responsibilities worksheet by naming your security officers.

Table 18. System responsibilities worksheet	
System Responsibilities worksheet	
Prepared by:	Date:

Table 18. System responsibilities worksheet (continued)
System Responsibilities worksheet
Instructions: • Learn about this worksheet in Planning individual user profiles.   • Use this worksheet to list everyone who has a user class other than *USER.   • Transfer information from this worksheet to the *User Class* column of the user profile worksheet.
Who is your primary security officer?   Who is your backup security officer?

Profile name	User name	Class	Comments

Related concepts

Implementing resource security
This information helps you establish resource security for workstations and printers by setting ownership and public authority to objects, as well as specific authority to applications.

Planning user security
Planning user security includes planning all areas where security affects the users on your system.

User profile worksheet

The individual user profile worksheet needs to be completed for each user group so the group's profile is recorded in your security plan.

Table 19. Individual user profile worksheet	
Individual User Profile worksheet	
Prepared by:	Date:
Instructions: • Learn how to prepare this worksheet in Planning individual user profiles. • Use this worksheet to record information about individual system users. Fill out one worksheet for each user group (group profile) that is on your system. • Use the blank columns at the right for any additional fields that you want to specify for individual users. • Learn how to enter this worksheet in Setting up user security.	
Group profile names:	
Owner of objects created:	Group authority to objects created:
Group authority type:	
Make an entry for each member of the group:	

User profile	Text (description)	User class	Limit capability			

Related concepts

Planning user security

Planning user security includes planning all areas where security affects the users on your system.

Planning resource security

This topic describes each of the components of resource security and how they all work together to protect information on your system. It also explains how to use CL commands and displays to set up resource security on your system.

Resource security defines which users are allowed to use objects on the system and what operations they are allowed to perform on those objects. Also, deciding who will be allowed access to what information on your system is an important part of your security policy.

Now that you have completed the process for planning users on your system, you can plan the resource security to protects objects on the system.

System values and user profiles control who has access to your system and prevent unauthorized users from signing on. Resource security controls the actions that authorized system users can perform after they have signed on successfully. Resource security supports the main goals of security on your system to protect:

- Confidentiality of information
- Accuracy of information to prevent unauthorized changes
- Availability of information to prevent accidental or deliberate damage

You may plan resource security differently, depending on whether your company develops applications or purchases them. For applications you develop, you should communicate the requirements for security of the information to the programmer during the application design process. When you purchase applications, you need to determine your security needs and match those needs with the way your provider has designed your applications. The techniques described here should help you in both cases.

This information provides a basic approach to planning resource security. It introduces the main techniques and shows how you can use them. The methods described here will not necessarily work for every company and every application. Consult your programmer or application provider as you plan resource security.

This topic list is provided to help you plan resource security:

- Understanding types of authority
- Planning security for application libraries
- Determining ownership of libraries and objects
- Grouping objects
- Protecting printer output
- Protecting workstations
- Implementing resource security
- Planning your application installation

These planning forms are helpful when planning system level security:

- Complete an Application description worksheet for each application on your system.
- Reference Planning object authority to plan how you will establish ownership and public authority to your applications after you load them.
- Use the Authorization list worksheet to list the objects that the list and the groups and individuals who have access to the list secure.
- Use the Printer Output Queue and Workstation Security worksheet to list any workstation or output queue that requires special protection.

Determining your objectives for your resource security: To begin to plan resource security, you must first understand your objectives. The system provides flexible implementation of resource security. It gives you the power to protect critical resources exactly the way you want. But resource security also

introduces additional overhead to your applications. For example, whenever an application needs an object, the system must check the user's authority to that object. You must balance your need for confidentiality against the cost of performance. As you make resource security decisions, weigh the value of security against its cost. To prevent resource security from degrading the performance of your applications, follow these guidelines:

- Keep your resource security scheme simple.
- Secure only those objects that you need to secure.
- Use resource security to supplement, not replace, the other tools for protecting information, such as:
  - Limiting users to specific menus and applications.
  - Preventing users from entering commands by limiting capabilities in user profiles.

Begin your resource security planning by defining your objectives. You can define your security objectives on either the Application Description form or the Library Description form. The form that you use depends on how your information is organized in libraries.

Planning security for workstations: After planning resource security for printers and printer output, you can begin planning workstation security. On your Physical Security Plan, you listed workstations that represent a security risk because of their location. Use this information to determine which workstations you need to restrict.

You can encourage the people who use these workstations to be particularly aware of security. They should sign off whenever they leave their workstations. You may want to record your decision about sign off procedures for vulnerable workstations in your security policy. You can also limit which functions can be performed at those workstations to minimize the risks.

The easiest method for limiting function at a workstation is to restrict it to user profiles with limited function. You may choose to prevent people with security officer or service authority from signing on at every workstation. If you use the QLMTSECOFR system value to do this, people with security officer authority can sign on only at specifically authorized workstations. Prepare the workstation portion of the Output Queue and Workstation Security form to document your workstation security policy.

Summary of resource security recommendations: After you finish planning workstation security, you can review the following resource security recommendations. The system offers many options for protecting the information on your system. This gives you the flexibility to design the resource security plan that is best for your company. But this wealth of options can also be confusing. For a basic approach to planning resource security use these guidelines:

- Move from the general to the specific:
  - Plan security for libraries. Deal with individual objects only when necessary.
  - Plan public authority first, followed by group authority, and individual authority.
- Make the public authority for new objects in a library (CRTAUT) the same as the public authority you defined for the majority of existing objects in the library.
- Try not to give groups or individuals less authority than the public has. This diminishes performance, may lead to mistakes later, and makes auditing difficult. If you know that everyone has at least the same authority to an object that the public has, it makes planning and auditing security easier.
- Use authorization lists to group objects with the same security requirements. Authorization lists are simpler to manage than individual authorities and aid in recovery of security information.
- Create special user profiles as application owners. Set the owner password to *NONE.
- Avoid having applications owned by IBM-supplied profiles, such as QSECOFR or QPGMR.
- Use special output queues for confidential reports. Put the output queue in the same library as the confidential information.
- Limit the number of people who have security officer authority.
- Be careful when granting *ALL authority to objects or libraries. People with *ALL authority can accidentally delete things.

To ensure that you have planned successfully for setting up resource security, you should have gathered the following information:

- Fill in Part 1 and Part 2 of the Library description forms for all your application libraries.
- On your Individual user profile forms fill in the Owner of objects created and Group authority over objects created fields.
- On your Naming conventions form describe how you plan to name authorization lists.
- Prepare Authorization List forms.
- Add authorization list information to your Library description forms.
- Prepare an Output queue and workstation security form.

Now you are ready to plan your application installation.

Related concepts

Resource security
You can use resource security on the system to control the actions of authorized users after successful authentication.

Planning library security

Many factors affect how you choose to group your application information into libraries and manage libraries. This topic addresses some of the security issues associated with library design.

To access an object, you need authority to the object itself and to the library containing the object. You can restrict access to an object by restricting the object itself, the library containing the object, or both.

Planning libraries

A library is like a directory used to locate the objects in the library. *USE authority to a library allows you to use the directory to find objects in the library. The authority for the object itself determines how you can use the object. *USE authority to a library is sufficient to perform most operations on the objects in the library.

Using public authority for objects and restricting access to libraries can be a simple, effective security technique. Putting programs in a separate library from other application objects can also simplify security planning. This is particularly true if files are shared by more than one application. You can use authority to the libraries containing application programs to control who can perform application functions.

Library security is effective only if these rules are followed:

- Libraries contain objects with similar security requirements.
- Users are not allowed to add new objects to restricted libraries and changes to programs in the libraries are controlled. That is, application libraries should have public authority of *USE or *EXCLUDE unless users need to create objects directly into the library.
- Library lists are controlled.

Describing library security

As an application designer, you need to provide information about a library for the security administrator. The security administrator uses this information to decide how to secure the library and its objects. Typical information needed is:

- Any application functions which add objects to the library.
- Whether any objects in the library are deleted during application processing.
- What profile owns the library and its objects.
- Whether the library should be included on library lists.

See the following sample format for providing this information:

```
Library name: ITEMLIB
```

```
Public authority to the library: *EXCLUDE

Public authority to objects in the library: *CHANGE

Public authority for new objects (CRTAUT): *CHANGE

Library owner: OWNIC Include on library lists? No.  Library is added to
library list by
initial application program or initial query program.

List any functions that require *ADD authority to the library: No objects are
added to
the library during normal application processing.

List any objects requiring *OBJMGT or *OBJEXIST authority and what functions
need that
authority: All work files whose names begin with the characters ICWRK are
cleared at
month-end. This requires *OBJMGT authority.
```

Use library security to complement menu security

To access an object in a library, you must have authority both to the object and to the library. Most operations require either *EXECUTE authority or *USE authority to the library. Depending on your situation, you may be able to use library authority as a simple means for securing objects. For example, assume that for the Order-Entry menu example, everyone who has authority to the Order Entry menu can use all of the programs in the ORDERPGM library.

Rather than securing individual programs, you can set the public authority to the ORDERPGM library to *EXCLUDE. You can then grant *USE authority to the library to specific user profiles, which will allow them to use the programs in the library. This assumes that public authority to the programs is *USE or greater. Library authority can be a simple, efficient method for administering object authority. However, you must ensure that you are familiar with the contents of the libraries that you are securing so that you do not provide unintended access to objects.

Planning security for application libraries: After you have determined your objectives for your resource security, you can begin planning security for application libraries. Choose one of your application libraries to work with as you follow the process described here. If your system stores files and programs in separate libraries, choose a library that contains files. When you finish the topic, repeat these steps for your remaining application libraries.

Review the information that you gathered about your the applications and libraries:

- Application Description form
- Library Description form
- User Group Description form for any groups that need the library
- Your diagram of applications, libraries, and user groups

Think about which groups need the information in a library, why they need it, and what they need to do with it. Determine the contents of the application libraries, as they contain the important application files. They may also contain other objects, most of which are programming tools to make the application work properly, such as:

- Work files
- Data areas and messages queues
- Programs
- Message files
- Commands
- Output queues

Most of the objects, other than files and output queues, do not represent a security exposure. They typically contain small amounts of application data, often in a format that is not easily intelligible outside the programs. You can list names and descriptions of all the objects in a library by using the **Display Library** command. For example, to list contents of the CONTRACTS library: DSPLIB LIB(CONTRACTS) OUTPUT(*PRINT) Next you need to decide what public authority you want to have for application libraries and program libraries.

Deciding public authority to application libraries: For purposes of resource security, the public means anyone you authorize to sign on to your system. Public authority allows a user with no other authority, access to an object. In addition to deciding public authority for objects already in the library, you can specify the public authority for any new objects added to the library later. To do this, you use the Create Authority (CRTAUT) parameter. Typically, public authority to library objects and library create authority for new objects should be the same.

The Create Authority (QCRTAUT) system value determines the system-wide public authority for new objects. IBM ships the QCRTAUT system value with *CHANGE. Avoid changing QCRTAUT, because many system functions use it. If you specify *SYSVAL for the CRTAUT of an application library, it uses the QCRTAUT system value (*CHANGE).

Use public authority as much as possible, for both simplicity and good performance. To determine what public authority to a library should be, ask these questions:

- Should everyone in the company have access to most of the information in this library?
- What kind of access should people have to the majority of the information in this library?

Concentrate on decisions for the majority of the people and the majority of the information. Later, you will learn how to deal with the exceptions. Planning resource security is often a circular process. You may discover that you need to make changes to public authority after considering the requirements for specific objects. Try several combinations of public and private authority to both objects and libraries before you choose one that meets your security and performance needs.

Ensuring adequate authority: *CHANGE authority to objects and *USE authority to a library are adequate for most application functions. However, you need to ask your programmer or application provider some questions to determine if certain application functions require more authority:

- Are any files or other objects in the library deleted during processing? Are any files cleared? Are members added to any files? Deleting an object, clearing a file, or adding a file member requires *ALL authority to the object.
- Are any files or other objects in the library created during processing? Creating an object requires *CHANGE authority to the library.

Deciding public authority to program libraries: Often, application programs are kept in a separate library from files and other objects. You are not required to use separate libraries for applications, but many programmers use this technique when they design applications. If your application has separate program libraries, you need to decide the public authority to those libraries.

You can use *USE authority to both the library and the programs in the library to run programs, but program libraries may have other objects that require additional authority. Ask your programmer a few questions:

- Does the application use data areas or message queues to communicate between programs? Are they in the program library? *CHANGE authority to the object is required for handling data areas and message queues.
- Are any objects in the program library, such as data areas, deleted during processing? *ALL authority to an object is required to delete the object.
- Are any objects in the program library, such as data areas, created during processing? *CHANGE authority to the library is required to create any new objects in the library.

Fill in all of the resource security information on both parts of the Library Description form except the library owner and the authorization list column. You then can determine ownership of libraries and objects.

Note: A knowledgeable programmer who has access to a library may be able to hold access to objects in the library even after you have revoked authority to the library. If a library contains objects with high security requirements, restrict the objects and the library for complete protection.

Determining ownership of libraries and objects: After you plan security for application libraries, you can decide ownership of libraries and objects. Each object is assigned an owner when it is created. The owner of the object automatically has all authority to the object, which includes authorizing others to use the object, changing the object, and deleting it. The security officer can perform these functions for any object on the system.

The system uses the profile of the object owner to track who has authority to the object. The system completes this function internally. This may not affect the user profile directly. However, if you do not plan object ownership properly, some user profiles can become very large.

When the system saves an object, the system also saves the name of the owning profile with it. The system uses this information if it restores the object. If the owning profile for a restored object is not on the system, the system transfers ownership to an IBM-supplied profile called QDFTOWN.

Recommendations: The recommendations below apply in many, but not all, situations. After reviewing the recommendations, discuss your ideas for object ownership with your programmer or application provider. If you purchase applications, you may not be able to control what profile owns libraries and objects. The application may be designed to prevent changes of ownership.

- Avoid using an IBM-supplied profile, such as QSECOFR or QPGMR, as an application owner. These profiles own many objects in IBM-supplied libraries and are already very large.

- Normally, a group profile should not own an application. Every member in the group has the same authority as the group profile, unless you specifically assign lower authority. In effect, you would be giving every member of the group complete authority to the application.

- If you plan to delegate responsibility for control of applications to managers in various departments, those managers can be the owners of all the application objects. However, the manager of an application might change responsibilities, and you would then transfer ownership of all the application objects to a new manager.

- Many people use the technique of creating a special owner profile for each application with the password set to *NONE. The owning profile is used by the system to manage authorities for the application. The security officer, or someone with that authority performs the actual management of the application or it is delegated to managers with *ALL authority to particular applications.

Decide what profiles should own your applications. Enter the owner profile information on each Library Description form. You can now decide ownership and access for your user libraries.

Deciding ownership and access for user libraries: If your system has the IBM Query for i licensed program or another decision support program, your users need a library for storing the query programs they create. Normally, this library is the current library in the user profile. If a user belongs to a group, you use a field in the user profile to specify whether the user or the group owns any objects created by the user.

If the user owns the objects, you can specify what authority the group members have to use the objects. You can also specify whether the group's authority is primary group authority or private authority. Primary group authority may provide better system performance. The Group authority to objects created field is not used if the owner of objects created is the group. Group members automatically have *ALL authority to any objects created.

Decide who should own and have access to user libraries. Enter your choices in the Owner of objects created and Group authority over objects fields on the Individual User Profile form. Now you are ready to begin grouping objects.

Grouping objects

After you have determined ownership of libraries and objects, you can begin grouping objects on the system. To simplify managing authorities, use an authorization list to group objects with the same requirements. You can then give the public, group profiles, and user profiles authority to the authorization

list rather than to the individual objects on the list. The system treats every object that you secure by an authorization list the same, but you can give different users different authorities to the entire list.

An authorization list makes it easier to reestablish authorities when you restore objects. If you secure objects with an authorization list, the restore process automatically links the objects to the list. You can give a group or user the authority to manage an authorization list (*AUTLMGT). Authorization list management allows the user to add and remove other users from the list and to change the authorities for those users.

Recommendations:

- Use authorization lists for objects that require security protection and have similar security requirements. Using authorization lists encourages you to think about categories of authority rather than individual authorities. Authorization lists also make it easier to restore objects and to audit the authorities on your system.
- Avoid complicated schemes that combine authorization lists, group authority, and individual authority. Choose the method that best suits the requirement, rather than using all of the methods at the same time.

You will also need to add the naming convention for authorization lists to your Naming conventions form. Once you have prepared an Authorization List form, go back and add that information to your Library description form. Your programmer or application provider might have already created authorization lists. Be sure to check with them.

Library security

Most objects on the system reside in libraries. To access an object, you need authority both to the object itself and the library in which the object resides. For most operations, including deleting an object, *USE authority to the object library is sufficient, in addition to the authority required for the object. Creating a new object requires *ADD authority to the object library. Appendix D shows what authority is required by CL commands for objects and the object libraries.

Using library security is one technique for protecting information while maintaining a simple security scheme. For example, to secure confidential information for a set of applications, you can do the following actions:

- Use a library to store all confidential files for a particular group of applications.
- Ensure that public authority is sufficient for all objects in the library that are used by applications (*USE or *CHANGE).
- Restrict public authority to the library itself (*EXCLUDE).
- Give selected groups or individuals authority to the library, using *USE or *ADD if the applications require it.

Although library security is a simple, effective method for protecting information, it may not be adequate for data with high security requirements. Highly sensitive objects should be secured individually or with an authorization list, rather than relying on library security.

Library security and library lists

When a library is added to a user's library list, the authority the user has to the library is stored with the library list information. The user's authority to the library remains for the entire job, even if the user's authority to the library is revoked while the job is active. When access is requested to an object and *LIBL is specified for the object, the library list information is used to check authority for the library. If a qualified name is specified, the authority for the library is specifically checked, even if the library is included in the user's library list.

Note: If a user is running under adopted authority when a library is added to the library list, the user remains authorized to the library even when the user is no longer running under adopted authority. This represents a potential security exposure. Any entries added to a user's library list by a program running under adopted authority should be removed before the adopted authority program ends.

In addition, applications that use library lists rather than qualified library names have a potential security exposure. A user who is authorized to the commands to work with library lists might potentially run a different version of a program.

Determining library owner

When you plan your application installation, you must first decide the user profiles and installation values for each application.

Determining user profiles and installation values for applications: Before you install an application that was created on another system, you may need to create one or more user profiles. The user profile that owns the application libraries and objects should exist on your system before you load the libraries on your system. Record the profiles you need to create for each library and what parameters the profiles need on the Application installation form.

To determine the installation values necessary, ask your programmer or application provider the following questions and record their answers on the Application installation form:

- What profile owns the application library?
- What profile owns the objects in the library?
- What is the public authority to the library (AUT)?
- What is the public authority for new objects (CRTAUT)?
- What is the public authority for objects in the library?
- What programs, if any, adopt the authority of the owner?

Find out whether your programmers or application provider have created any authorization lists for the application. Prepare an Authorization list form for each created authorization list or ask your programmer for information about the list. You can determine whether you should change any installation values.

Changing installation values for applications: Compare the information from the Application installation form with your resource security plan for the library on the Library description form. If they are different, you need to decide what changes to make after the application is installed.

Changing application ownership: If your programmer or application provider has created a special profile to own the application libraries and objects, consider using that profile, even if it does not match your naming conventions.

Transferring ownership of objects can take a long time and should be avoided. If one of the IBM-supplied group profiles, such as QSECOFR or QPGMR, owns the application, you should transfer ownership to another profile after you install the application. Sometimes programmers design applications to prevent changes in object ownership. Try to work within the restrictions and still meet your own requirements for managing security. However, if an IBM-supplied profile, such as QSECOFR, owns the application, you and your programmer or application provider need to develop a plan to change ownership. Ideally, you should change ownership before you install the application.

Changing public authority: When you save objects, you also save their public authority with them. When you restore an application library to your system, the library and all its objects will have the same public authorities they had when they were saved. This is true even if you saved the library on another system. The CRTAUT value for a library, which grants public authority for new objects, does not affect objects that are restored. They are restored with their saved public authority, regardless of the CRTAUT for the library.

You should change the public authority of libraries and objects to match your plan on the Library description form. To ensure that you have planned your application installation completely, you should:

- Finish filling out your initial Application installation form. Then go back and prepare forms for each additional application.
- Review all your forms and make sure they are complete. Make copies of your forms and keep them in a secure location until you have installed your system and your licensed programs.

Library description worksheet

After you have described your naming conventions, you should describe the libraries on your system. Libraries identify and organize objects on your system.

Placing similar files together in one library allows users easy access to critical applications and files. You can also customize your users' authorities, so that they can access some libraries, but not others. Describe all libraries that are on your system for each application. You may need to prepare more than one Library description form. Fill out only the descriptive information about the library. When you plan resource security for the library you will fill out the rest of the Library description form. You will need to add information about authorities to the libraries later. See Planning security for application libraries for details on completing the remainder on the Library description form. Before you continue, be sure to complete the library and file parts of the Naming conventions worksheet, and the descriptive information about the Library description worksheet for each application library.

Table 20. Library Description worksheet	
Library description worksheet	
Prepared by:	Date:
Instructions:	
• Learn about this worksheet in Determining library ownership. • Use this worksheet to describe your main libraries and define resource security requirements for them. • Fill out one worksheet for each major application library on your system.	
Library name:	Descriptive name (text):
Briefly describe the function of this library:	
Define the security objectives for the library, such as whether any information is confidential:	
Public authority to the library:	
Public authority to objects in the library:	
Public authority for new objects (CRTAUT):	
Library owner:	

Related concepts

Implementing resource security
This information helps you establish resource security for workstations and printers by setting ownership and public authority to objects, as well as specific authority to applications.

Naming conventions worksheet

When you know how the system names objects, you can plan and monitor security, solve problems, and plan backup and recovery.

Most applications have rules for assigning names to objects, such as libraries, files, and programs. If your applications come from different sources, they probably each have their own unique naming system. Be sure to record all the naming conventions of applications and objects on the Naming conventions worksheet. List the rules your applications use for naming libraries and files. You may want to use the blank lines for other naming conventions, such as programs and menus. If your applications come from different sources, they probably each have unique naming conventions. Describe the naming conventions for each application. You may need to prepare more than one Naming conventions worksheet.

Table 21. Naming conventions worksheet	
Naming conventions worksheet	
Prepared by:	Date:

Table 21. Naming conventions worksheet (continued)		
Naming conventions worksheet		
Instructions		
• You do not need to enter information from this worksheet directly into the system.		
• Use this worksheet to describe how you will assign names to the objects on your system. Give examples of each one.		
Type of object	**Naming convention**	**Example**
Group profiles		
User profiles		
Authorization lists		
Libraries		
Files		
Calendars		
Devices		
Tapes		

Planning application security

An overview for creating an application security plan for your company.

To plan the right security for your applications, you need to know:

• What information do you plan to store on the system?
• Who needs access to that information?
• What kind of access do people need? Do they need to change information or only view it?

As you go through these application planning topics, you answer the first question about what information you plan to store on your system. In subsequent topics, you decide who needs that information and what kind of access users need. You do not enter the application planning information into the system; however, you will need it when you set up users and resource security.

What is an application?

In the first planning step for application security, you need to describe the applications you plan to run on your system. An application is a group of functions that logically belong together. Usually, two different types of applications can run on your server:

• *Business applications*: Applications you buy or develop to perform specific business functions, such as order processing or inventory management.
• *Special applications*: Applications you provide that are used throughout your company to perform a variety of activities that are not specific to a business process.

What forms do you need?

• Application description worksheet
• Library description worksheet
• Naming conventions worksheet

Describing your applications

At this point, you need to gather some general information about each of your business applications. Add information about your application to the appropriate fields on the Application Description form as described below. Later you can use this information to help you plan user groups and application security:

Application name and abbreviation
Give the application a short name and an abbreviation that you can use as shorthand on forms and for naming objects that the application uses.

Descriptive information
Briefly describe what the application does.

Primary menu and library
Identify which menu is the primary menu for accessing the application. Indicate the library in which the menu is. Typically the primary menu leads to other menus with specific application functions. Users like to see the primary menu for their main application immediately after signing on to the system.

Initial program and library
Sometimes applications run an initial program that sets up background information for the user or does security checking. If an application has an initial program or setup program, list it on the form.

Application libraries
Each application typically has a main library for its files. Include all libraries that the application uses, including program libraries and libraries that other applications own. For example, the JKL Toy Company's customer order application uses the inventory library to get item balances and descriptions. You can use the relationship between libraries and applications to determine who needs access to each library.

Finding information about your applications

If you do not already know the information you need about your applications, you may need to contact your programmer or application provider. Here are some methods for gathering the information yourself, if you do not have access to this information about an application that runs on your system:

- Users of the application can probably tell you the name of the primary menu and library, or you can watch them sign on to the system.

- If users see the application immediately after signing on, look at the Initial program field in their user profiles. This field contains the initial program to the application. You can use the **DSPUSRPRF** command to view the initial program.

- You can list the names and descriptions of all the libraries on your system. Use the **DSPOBJD *ALL *LIB**. This displays all libraries on your system.

- You can observe active jobs while users are running the application. Use the Work with Active Jobs (WRKACTJOB) command with intermediate assistance level to get detailed information about interactive jobs. Display jobs and look at both library lists and their object locks to find out which libraries are being used.

- You can display batch jobs in an application using the Work with User Jobs (**WRKUSRJOB**) command.

To ensure that you gather all the information you need to plan your application security, you should complete these tasks before continuing:

- Complete an Application description form for each of your business applications. Fill out the entire form, except the security requirements section. You will use that section to plan resource security for the application as described in the topic Resource security.

- Prepare an Application description form for each special application, if applicable. Using the form helps you determine how to provide access to the application.

Note: Preparing Application description forms for special applications from IBM, such as IBM Query for i is optional. Access to the libraries used by these applications does not require any special planning. However, you may find it useful to gather the information and prepare the forms.

Planning applications to prevent large profiles

Because of the potential effects to performance and security, IBM strongly recommends using these recommendations to avoid profiles from becoming too full:

- Do not have one profile own everything on your system.

   Create special user profiles to own applications. Owner profiles that are specific to an application make it easier to recover applications and to move applications between systems. Also, information about private authorities is spread among several profiles, which improves performance. By using several owner profiles, you can prevent a profile from becoming too large because of too many objects. Owner profiles also allow you to adopt the authority of the owner profile rather than a more powerful profile that provides unnecessary authority.

- Avoid having applications owned by IBM-supplied user profiles, such as QSECOFR or QPGMR.

   These profiles own a large number of IBM-supplied objects and can become difficult to manage. Having applications owned by IBM-supplied user profiles can also cause security problems when moving applications from one system to another. Applications owned by IBM-supplied user profiles can also affect performance for commands, such as **CHKOBJITG** and **WRKOBJOWN**.

- Use authorization lists to secure objects.

   If you are granting private authorities to many objects for several users, you should consider using an authorization list to secure the objects. Authorization lists will cause one private authority entry for the authorization list in the user's profile rather than one private authority entry for each object. In the object owner's profile, authorization lists cause an authorized object entry for every user granted authority to the authorization list rather than an authorized object entry for every object multiplied by the number of users that are granted the private authority.

Related reference
Application description worksheet
Complete an Application description worksheet for each application on your system.

Planning object authority
This information is helpful when planning object authority.

Your challenge as security administrator is to protect your organization's information assets without frustrating the users on your system. You need to make sure that users have enough authority to do their jobs without giving them the authority to browse throughout the system and to make unauthorized changes.

The IBM i operating system provides integrated object security. Users must use the interfaces that the system provides to access objects. For example, if you want to access a database file, you must use commands or programs that are intended for accessing database files. You cannot use a command that is intended for accessing a message queue or a job log.

Whenever you use a system interface to access an object, the system verifies that you have the authority to the object that is required by that interface. Object authority is a powerful and flexible tool for protecting the assets on your system. Your challenge as a security administrator is to set up an effective object security scheme that you can manage and maintain.

Object authority enforcement

Whenever you try to access an object, the operating system checks your authority to that object. However, if the security level on your system (QSECURITY system value) is set to 10 or 20, every user automatically has authority to access every object because every user profile has *ALLOBJ special authority.

Object authority tip: If you are not sure whether you are using object security, check the QSECURITY system value. If QSECURITY is 10 or 20, you are not using object security. You must plan and prepare before you change to security level 30 or higher. Otherwise, your users may not be able to access the information that they need.

Object authority to system commands and programs

When to restrict authority to IBM-supplied objects:

- When you have more than one national language on your system, your system has more than one system (QSYS) library. Your system has a QSYSxxxx library for each national language on your system. If you are using object authority to control access to system commands, remember to secure the command in the QSYS library and in every QSYSxxx library on your system.
- The System/38™ library sometimes provides a command with function that is equivalent to the commands that you want to restrict. Be sure you restrict the equivalent command in the QSYS38 library.
- If you have the System/36™ environment, you may need to restrict additional programs. For example, the QY2FTML program provides System/36 file transfer.

Grouping objects

After you have determined ownership of libraries and objects, you can begin grouping objects on the system. To simplify managing authorities, use an authorization list to group objects with the same requirements. You can then give the public, group profiles, and user profiles authority to the authorization list rather than to the individual objects on the list. The system treats every object that you secure by an authorization list the same, but you can give different users different authorities to the entire list.

An authorization list makes it easier to reestablish authorities when you restore objects. If you secure objects with an authorization list, the restore process automatically links the objects to the list. You can give a group or user the authority to manage an authorization list (*AUTLMGT). Authorization list management allows the user to add and remove other users from the list and to change the authorities for those users.

Recommendations:

- Use authorization lists for objects that require security protection and that have similar security requirements. Using authorization lists encourages you to think about categories of authority rather than individual authorities. Authorization lists also make it easier to restore objects and to audit the authorities on your system.
- Avoid complicated schemes that combine authorization lists, group authority, and individual authority. Choose the method that best suits the requirement, rather than using all of the methods at the same time.

You will also need to add the naming convention for authorization lists to your Naming Conventions form. Once you have prepared an Authorization List form, go back and add that information to your Library Description form. Your programmer or application provider might have already created authorization lists. Be sure to check with them.

You can define resource security for individual objects on the system. You can also define security for groups of objects using either library security or an authorization list.

Defining how information can be accessed
    You can define what operations can be preformed on objects, data, and fields.
Defining what information can be accessed
    You can define resource security for individual objects on the system. You can also define security for groups of objects using either library security or an authorization list.
Authority for new objects in a library
    You can specify the authority for new objects in a library.
Authority for new objects in a directory
    You can specify the authority for new objects in a directory.
Objects that adopt the owner's authority
    You can assign adopted authority to a user program to allow the user to change a customer file.
Programs that ignore adopted authority
    You can specify the Use adopted authority (USEADPAUT) parameter to control whether a program uses the adopted authority.
Authority holders
    An authority holder is a tool for keeping the authorities for a program-described database file that does not currently exist on the system.

Working with authority

This topic describes commonly used methods for setting up, maintaining, and displaying authority information about your system.

Determining object ownership

Every object on the system has an owner. The owner has *ALL authority to the object by default.

Object Ownership

Each object is assigned to an owner when it is created. The owner is either the user who creates the object or the group profile if the member user profile has specified that the group profile should be the owner of the object. When the object is created, the owner is given all the object and data authorities to the object.

Default Owner (QDFTOWN) User Profile

The Default Owner (QDFTOWN) user profile is an IBM-supplied user profile that is used when an object has no owner or when object ownership might pose a security exposure.

Assigning authority and ownership to new objects

You can assign authority and ownership to new objects on the system.

If your programmer or application provider has created a special profile to own the application libraries and objects, consider using that profile, even if it does not match your naming conventions. Transferring ownership of objects can take a long time and should be avoided. If one of the IBM-supplied group profiles, such as QSECOFR or QPGMR, owns the application, you should transfer ownership to another profile after you install the application. Sometimes, programmers design applications to prevent changes in object ownership. Try to work within the restrictions and still meet your own requirements for managing security. However, if an IBM-supplied profile, such as QSECOFR, owns the application, you and your programmer or application provider need to develop a plan to change ownership. Ideally, you should change ownership before you install the application.

When you save objects, you also save their public authority with them. When you restore an application library to your system, the library and all its objects will have the same public authorities they had when they were saved. This is true even if you saved the library on another system. The CRTAUT value for a library does not affect objects that are restored. They are restored with their saved public authority, regardless of the CRTAUT for the library. You should change the public authority of libraries and objects to match your plan on the Library description form.

Group ownership of objects
Several security differences exist when an object is owned by a group, not an individual.

Group ownership of objects

When an object is created, the system looks at the profile of the user creating the object to determine object ownership. If the user is a member of a group profile, the Owner field in the user profile specifies whether the user or the group should own the new object.

Primary group for an object

You can specify a primary group for an object. The name of the primary group profile and the primary group's authority to the object are stored with the object. Using primary group authority may provide better performance than private group authority when checking authority to an object.

Working with primary group authority

When you change an object's primary group, you specify what authority the new primary group has.

Using a referenced object

Both the Edit Object Authority display and the **GRTOBJAUT** command allow you to give authority to an object, to a group of objects, based on the authority of a referenced object. This is a useful tool in some situations, but you should also evaluate the use of an authorization list to meet your requirements.

Application description worksheet

Complete an Application description worksheet for each application on your system.

Table 22. Application description worksheet	
Application description worksheet	
Prepared by:	Date:
Instructions	
• Prepare a separate worksheet for each application. • You do not need to enter the information about this worksheet into the system.	
Application name:	Abbreviation:
Brief description of the application:	
Primary menu name:	Library:
Initial program name:	Library:
List the libraries used by the application for both files and programs:	
Define the security objectives for the application, such as whether any information is confidential:	

Related concepts

Implementing resource security
This information helps you establish resource security for workstations and printers by setting ownership and public authority to objects, as well as specific authority to applications.

Planning application security
An overview for creating an application security plan for your company.

Planning application installation

To finish planning resource security, you need to prepare for your application installation.

You need to plan who will have ownership and authority to your applications after you install them. The methods described here may not work for all applications. Consult your programmer or application provider for help with developing an effective installation plan.

If you plan to acquire an application from an application provider, use the information presented here to plan the security activities you need to do before and after you load the application libraries. If you plan to install an application that programmers developed on your own system, use this information to plan the security activities necessary to move the application from test to production status. Work through the steps with one application. Then go back and prepare Application installation forms for any additional applications.

Make a copy of the following forms and fill them in as you work through this information:

• Application description worksheet, you will need to complete one per application.
• Library description worksheet.
• Authorization list worksheet.

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Planning authorization lists

You can group objects with similar security requirements by using an authorization list.

Look at the group and individual authorities on your Library description forms. Decide if using authorization lists is appropriate. If so, prepare Authorization list forms and update your Library description forms with the authorization list information.

Authorization list security

From a security management view, an authorization list is the preferred method to manage objects that have the same security requirements. Even when there are only a few objects that are secured by the list, there is still an advantage to using an authorization list instead of using private authorities to the objects. It is also easier to secure any new objects with the same authorities as the existing objects.

Advantages of using an authorization list

You can make full use of the advantages of authorization lists to protect objects on your system.

Creating an authorization list

Use the Create Authorization List (**CRTAUTL**) command to create an authorization list.

Securing objects with an authorization list

To secure an object with an authorization list, you must own the object, have *ALL authority to it, or have *ALLOBJ special authority.

Related concepts

Comparison of group files and authorization lists
Group profiles are used to simplify managing user profiles that have similar security requirements. Authorization lists are used to secure objects with similar security requirements.

Adding users to an authorization list

Once you secure objects with an authorization list, use the Edit Authorization List (**EDTAUTL**) command to add the users listed on your Authorization list form:

1. Type EDTAUTL authorization-list-name.

2. On the Edit Authorization list display, press F6 (Add new users).

3. Enter the names of the users or groups and the authority they should have to the items on the list and press the Enter key. The new users should appear on the list.

Table 23. Errors and recovery methods when adding users to an authorization list	
Possible error	**Recovery**
You gave a user or group the wrong authority to the list.	You can change the authority on the Edit Authorization List display.
You added the wrong user or group to the list.	You can remove a user or group using the Remove Authorization List Entry (**RMVAUTLE**) command, or you can type blanks over the user's authority on the Edit Authorization List display.

Checking your work

- Use the Display Authorization List (**DSPAUTL**) command to list all the user authorities to the authorization list.
- Use F15 from the display to list all the objects secured by the authorization list.

Before you set up specific authorities, complete these tasks:

1. Use the **CRTAUTL** command to create any authorization lists you need for the application.

2. Secure objects with authorization lists by using the **EDTOBJAUT** command.

3. Add users to authorization lists by using the **EDTAUTL** command.

Authorization lists worksheet

Use this worksheet to create an Authorization list for an application on your system.

Table 24. Authorization list worksheet

Authorization list worksheet					
Prepared by:			**Date:**		
Instructions					
• Prepare one worksheet for each authorization list. • Use the worksheet to list the objects and the groups and individuals who have access. • Keep the list in a secure location.					
Authorization list name:					
Description:					
List the objects which the list secures					
Object name	Object type	Object library	Object name	Object type	Object library
List groups and users who have access to the list					
Group or user	Type of access allowed	List management?	Group or user	Type of access allowed	List management?

Related concepts

Implementing resource security

This information helps you establish resource security for workstations and printers by setting ownership and public authority to objects, as well as specific authority to applications.

Planning database file security

There are several steps necessary to create a security plan for your database files.

Structured Query Language (SQL) uses cross-reference files to keep track of database files and their relationships. These files are collectively referred to as the SQL catalog. Public authority to the SQL catalog is *READ. This means that any user who has access to the SQL interface can display the names and text descriptions for all files on your system. The SQL catalog does not affect the normal authority required to access the contents of database files.

Care should be taken when using a CL program that adopts authority to start SQL or Query Manager. Both of these query programs allow users to specify a file name. The user can, therefore, access any file that the adopted profile has authority to.

Planning file security

The information contained in database files is usually the most important asset on your system. The protection of database files will require extra planning, securing, and monitoring.

Planning file security

Securing logical files

Logical files are used to secure fields in database files.

Securing logical files

Planning integrated file system security

The integrated file system provides you with multiple ways to store and view information on the server. Careful consideration needs to be given as to who will be allowed to view which files and in what ways.

The integrated file system is a part of the IBM i operating system that supports stream input and output operations. It provides storage management methods that are similar to, and compatible with, personal computer operating systems and UNIX® operating systems. With the integrated file system, all objects on the system can be viewed from the perspective of a hierarchical directory structure.

However, in most cases, users view objects in the way that is most common for a particular file system. For example, more common object types are in the QSYS.LIB file system. Typically, users view these objects from the perspective of libraries. Users typically view objects in the QDLS file system from the perspective of documents within folders. The root (/), QOpenSys, and user-defined file systems present a structure of hierarchical (nested) directories. As a security administrator, you need to understand the following aspects:

- Which file systems are used on your system
- The unique security characteristics of each file system

The integrated file system approach to security

The root file system acts as an umbrella, or a foundation, for all other server file systems. At a high level, it provides an integrated view of all of the objects on the system. Other file systems that can exist on systems provide varying approaches to object management and integration, depending on the underlying purpose of each file system. The optical (QOPT) file system, for example, allows applications and servers, to access the CD-ROM drive on the system. Similarly, the QFileSvr.400 file system allows applications to access integrated file system data on remote systems.

The security approach for each file system depends on the data that the file system makes available. The QOPT file system, for example, does not provide object-level security because no technology exists to write authority information to a CD-ROM. For the QFileSvr.400 file system, access control occurs at the remote system, where the files are physically stored and managed. Despite the differing security models, many file systems support consistent management of access control through the integrated file system commands, such as Change Authority (CHGAUT) and Change Owner (CHGOWN).

Here are some tips related to the lesser known details of integrated file system security. The integrated file system is designed to follow POSIX standards as closely as possible. This leads to some interesting behavior where server authority and POSIX permissions are combined:

- Do not remove the private authority for a user to a directory owned by that user, even if that user is authorized through the public authority, a group, or authorization list. When working with libraries or folders in the standard server security model, removing the owner's private authority will reduce the amount of authority information stored for a user profile and will not affect other operations. But, because of the way the POSIX standard defines permission inheritance for directories, the owner of a newly-created directory will have the same object authorities to that directory as the owner of the parent has to the parent, even if the owner of the newly-created directory has other private authorities to the parent.

  Here is an example: USERA owns directory /DIRA, but USERA's private authorities have been removed. USERB has private authority to /DIRA. USERB creates directory /DIRA/DIRB. Because USERA has no object authorities to /DIRA, USERB will have no object authorities to /DIRA/DIRB. USERB will be unable to rename or delete /DIRA/DIRB without further action to change USERB's object authorities. This also comes into play when creating files with the open() API using the O_INHERITMODE flag. If USERB created a file /DIRA/FILEB, USERB would have no object authorities and no data authorities to it. USERB cannot write to the new file.

- Adopted authority is not honored by most physical file systems. This includes the root (/), QOpenSys, QDLS, and user-defined file systems.

- Any objects are owned by the user profile which created the objects, even if the OWNER field of the user profile is set to *GRPPRF.
- Many file system operations require *RX data authority to every component of the path, including the root (/) directory. When experiencing authority problems, make sure to check the user's authorization to the root itself.
- Displaying or retrieving the current working directory (DSPCURDIR, getcwd(), and so on) requires *RX data authority to every component in the path. However, changing the current working directory (CD, chdir(), and so on) only requires *X data authority to every component. Therefore, a user may change the current working directory to a certain path and then be unable to display that path.
- The intent of the COPY command is to duplicate an object while the intent of the CPYTOSTMF command, however, is just to duplicate the data. The authority settings on the new object can be controlled with either command by using the Authority (AUT) parameter. Each command works slightly different with regard to how the authority is set on the new object. The authority for the new object created by the COPY command may be set based on the authority of the original object, based on the authority for the directory where the new object is created, or a combination of the two. The CPYTOSTMF has similar options on the AUT parameter, or the default option (*DFT) may be selected. With the default option, the creator/owner will be granted *RWX data authorities, but the primary group and *PUBLIC will not get any data authorities and object authorities are based on the object authorities of the directory where the new file is created.
- A user must be the owner or have *OBJMGT object authority to an object to retrieve authority information about the object. This pops up in some unexpected places, like COPY, which must retrieve the authority information on the source object to set the equivalent authorities on the target object.
- When changing the owner or group of an object, the user must not only have appropriate authority to the object, but also must have *ADD data authority to the new owner/group user profile and *DELETE data authority to the old owner/group profile. These data authorities are not related to the file system data authorities. These data authorities can be displayed using the DSPOBJAUT command and changed using the EDTOBJAUT command. This also pops up unexpectedly on COPY when it tries to set the group ID for a new object.
- The MOV command is prone to puzzling authority errors, especially when moving from one physical file system to another, or when performing data conversion. In these cases, the move actually becomes a copy-and-delete operation. Therefore, the MOV command can be affected by all of the same authority considerations as the COPY command (see the 2 previous comments) and the RMVLNK command, in addition to other specific MOV considerations.

When using the integrated file system APIs, you can restrict access to objects as you can when using data management interfaces. Be aware, however, that adopting authorities is not supported. An integrated file system API uses the authority of the user profile under which the job is running.

Each file system may have its own special authority requirements. NFS server jobs are the only exception to this rule. Network File System server requests run under the profile of the user whose user identification (UID) number was received by the NFS server at the time of the request. Authorities on your server are the equivalent of permissions on UNIX systems. The types of permissions are read and write - for a file or a directory, execute - for a file, or search - for a directory.

The permissions are indicated by a set of permission bits, which make up the mode of access of the file or directory. You can change the permission bits by using the change mode functions chmod() or fchmod(). You can also use the umask() function to control which file permission bits are set each time a job creates a file.

Root, QOpenSys, and user-defined file systems
These are security considerations for the root, QOpenSys, and user-defined file systems.

How authority works

The root, QOpenSys, and user-defined file systems provide a blending of IBM i, PC, and UNIX** capabilities both for object management and for security. When you use the integrated file system commands from an IBM i session (WRKAUT and CHGAUT), you can set all the normal IBM i object

authorities. This includes the *R, *W, and *X authorities that are compatible with Spec 1170 (UNIX-type operating systems).

Note: The root, QOpenSys, and user-defined file systems are functionally equivalent. The QOpenSys file system is case-sensitive. The root file system is not. User-defined file systems can be defined as case-sensitive. Because these file systems have the same security characteristics, in the topics that follow the names root file system, OOpenSys file system, and user-defined file system are used interchangeably.

When you access the root file system as an administrator from a PC session, you can set object attributes that the PC uses to restrict certain types of access:

- System
- Hidden
- Archive
- Read-only

These PC attributes are in addition to, not replacements for, IBM i object authority values.

When a user attempts to access an object in the root file system, IBM i enforces all of the object authority values and attributes for the object, whether those authorities are visible from the user's interface. For example, assume that the read-only attribute for an object is set on. A PC user cannot delete the object through a IBM Navigator for i interface. A IBM i user with a fixed function workstation cannot delete the object either, even if the IBM i user has *ALLOBJ special authority. Before the object can be deleted, the read-only attribute value must be set to off by using a PC function, the Change Attributes (CHGATR) command, or the Qp0lSetAttr() -- Set Attributes API. Similarly, a PC user might not have sufficient IBM i authority to change the PC-relevant security attributes of an object.

UNIX-type applications that run on IBM i use UNIX-like application programming interfaces (APIs) to access data in the root file system. With UNIX-like APIs, applications can recognize and maintain the following security information:

- Object owner
- Group owner (IBM i primary group authority)
- Read (files)
- Write (change contents)
- Execute (run programs or search directories)
- S_ISVTX mode bit (restricted rename and unlink attribute)

The system maps these data authorities to existing IBM i object and data authorities:

- Read (*R) = *OBJOPR and *READ
- Write (*W) = *OBJOPR, *ADD, *UPD, *DLT
- Execute (*X) = *OBJOPR and *EXECUTE

The concepts for other object authorities (*OBJMGT, *OBJEXIST, *OBJALTER, and *OBJREF) do not exist in a UNIX-type environment.

However, these object authorities do exist for all of the objects in the root file system. When you create an object using a UNIX-like API, that object inherits these authorities from the parent directory, resulting in the following situations:

- The new object's owner has the same object authority as the parent directory's owner.
- The new object's primary group has the same object authority as the parent directory's primary group.
- The new object's public has the same object authority as the parent directory's public.

The new object's data authority for owner, primary group, and public are specified on the API with the mode parameter. When all of the object authorities are set on, you get the authority behavior that you expect in a UNIX-type environment. It is best to leave them set on, unless you do not want the POSIX-like behavior.

When you run applications that use UNIX-like APIs, the system enforces all object authorities, whether they are visible to UNIX-type applications. For example, the system will enforce the authority of authorization lists even though the concept of authorization lists does not exist in UNIX-type operating systems.

When you have a mixed-application environment, you need to ensure that you do not make authority changes in one environment that will break your applications in another environment.

Security commands for the root, QOpenSys, and user-defined file systems
IBM provides a set of commands for working with objects in multiple file systems.

Commands

The following commands are related to system security:

- Change Auditing (CHGAUD)
- Change Authority (CHGAUT)
- Change Owner (CHGOWN)
- Change Primary Group (CHGPGP)
- Display Authority (DSPAUT)
- Work with Authority (WRKAUT)

In addition to commands, UNIX-like APIs are available to work with security.

Authorities

*RW
    Read/write

*R
    Read

*WX
    Write/execute

*W
    Write

*X
    Execute

Public authority to the root directory
When your system ships, the public authority to the root directory is *ALL for all object authorities and all data authorities.

This setting provides flexibility and compatibility with both what UNIX-like applications expect and what typical IBM i users expect. An IBM i user with command-line capability can create a new library in the QSYS.LIB file system by using the CRTLIB command. Normally, authority on a typical IBM i platform allows this. Similarly, with the shipped setting for the root file system, a typical user can create a new directory in the root file system, just like you can create a new directory on your PC.

As a security administrator, you must educate your users about adequately protecting the objects that they create. When a user creates a library, probably the public authority to the library should not be the default value, *CHANGE. The user should set public authority either to *USE or to *EXCLUDE, depending on the contents of the library.

If your users need to create new directories in the root (/), QOpenSys, or user-defined file systems, you have several security options:

- You can educate your users to override the default authority when they create new directories. The default is to inherit authority from the immediate parent directory. In the case of a newly created directory in the root directory, by default the public authority will be *ALL.

- You can create a primary subdirectory under the root directory. Set the public authority on that primary directory to an appropriate setting for your organization. Then instruct users to create any new personal directories in this primary subdirectory. Their new directories will inherit its authority.
- You can consider changing the public authority for the root directory to prevent users from creating objects in that directory. You can prevent users creating objects by removing *W, *OBJEXIST, *OBJALTER, *OBJREF, and *OBJMGT authorities. However, you need to evaluate whether this change will cause problems for any of your applications. You might, for example, have UNIX-like applications that expect to be able to delete objects from the root directory.

Restrict access to the QSYS.LIB file system
You can use this information to restrict access to the QSYS.LIB file system.

Because the root file system is the root file system, the QSYS.LIB file system appears as a subdirectory within the root directory. Therefore, any PC user with access to your server can manipulate objects stored in server libraries (the QSYS.LIB file system) with normal PC commands and actions. A PC user can, for example, drag a QSYS.LIB object, such as the library with your critical data files, to the shredder.

The system enforces all object authority whether it is visible to the interface. Therefore, a user cannot shred (delete) an object unless the user has *OBJEXIST authority to the object. However, if your system depends on menu access security rather than object security, the PC user might very well discover objects in the QSYS.LIB file system that are available for shredding.

As you expand the uses of your system and the different methods of access that you provide, you will soon discover that menu access security is not sufficient. However, servers also provide a simple way for you to prevent access to the QSYS.LIB file system through the root file system directory structure. You can use the QPWFSERVER authorization list to control which users can access the QSYS.LIB file system through the root directory.

When a user's authority to the QPWFSERVER authorization list is *EXCLUDE, the user cannot enter the QSYS.LIB directory from the root directory structure. When a user's authority is *USE, the user can enter the directory. Once the user has authority to enter the directory, normal object authority applies for any action the user attempts to perform on an object within the QSYS.LIB file system. In other words, the authority to the QPWFSERVER authorization list acts like a door to the entire QSYS.LIB file system. For the user with *EXCLUDE authority, the door is locked. For the user with *USE authority, or any greater authority, the door is open.

For most situations, users do not need to use a directory interface to access objects in the QSYS.LIB file system. Probably, you will want to set the public authority to the QPWFSERVER authorization list to *EXCLUDE. Keep in mind, that authority to the authorization list opens or closes the door to all libraries within the QSYS.LIB file system, including user libraries. If you encounter users who object to this exclusion, you can evaluate their requirements on an individual basis. If appropriate, you can explicitly authorize an individual user to the authorization list. However, you need to ensure that the user has appropriate authority to objects within the QSYS.LIB file system. Otherwise, the user might unintentionally delete objects or entire libraries.

Note:

1. When your system ships, the public authority to the QPWFSERVER authorization list is *USE.
2. If you explicitly authorize an individual user, the authorization list controls access only with NetServer file serving and file serving between servers. This does not prevent access to the same directories via FTP, ODBC, and other networks.

Securing directories
To access an object within the root file system, you read through the entire path to that object.

To search a directory, you must have *X (*OBJOPR and *EXECUTE) authority to that directory. Assume, for example, that you want to access the following object: `/companya/customers/custfile.dat`

You must have *X authority to the companya directory and to the customers directory.

With the root file system, you can create a symbolic link to an object. Conceptually, a symbolic link is an alias for a path name. Typically, it is shorter and easier to remember than the absolute path name.

A symbolic link does not, however, create a different physical path to the object. The user still needs *X authority to every directory and subdirectory in the physical path to the object.

For objects in the root file system, you can use directory security just as you might use library security in the QSYS.LIB file system. You can, for example, set the public authority of a directory to *EXCLUDE to prevent public users from accessing any objects within that tree.

Security for new objects

When you create a new object in the root (/) file system, the interface that you use to create it determines its authorities.

For example, if you use the CRTDIR command and its defaults, the new directory inherits all of the authority characteristics of its parent directory, including private authorities, primary group authority, and authorization list association. The following sections describe how authorities are determined for each type of interface.

Authority comes from the immediate parent directory, not from directories higher up in the tree. Therefore, as a security administrator, you need to view the authority that you assign to directories in a hierarchy from two perspectives:

- How the authority affects access to objects in the tree, like library authority.
- How the authority affects newly created objects, like the CRTAUT value for libraries.

Recommendation: You may want to give users who work in the integrated file system a home directory (for example, /home/usrxxx), then set the security appropriately, such as PUBLIC *EXCLUDE. Any directories the user creates under their home directory will then inherit the authorities.

Using the Create Directory command
When you create a new subdirectory by using the CRTDIR command, you have two options for specifying authority.

The two options you have for specifying authority:

- You can specify public authority. Public authority can be granted for data authority, object authority, or both.
- You can specify *INDIR for the data authority, object authority, or both. When you specify *INDIR for both data authority and object authority, the system makes an exact copy of all the authority information from the parent directory to the new object, including authorization list, primary group, public authority, and private authorities. The system does not copy private authority that the QSYS profile or the QSECOFR profile has to the object.

Creating a directory with an API
When you create a directory by using the mkdir() API, you specify the data authorities for the owner, the primary group, and public (using the authority map of *R, *W, and *X).

The system uses the information in the parent directory to set the object authorities for the owner, primary group, and public. Because UNIX-type operating systems do not have the concept of object authorities, the mkdir() API does not support specifying object authorities. If you want different object authorities, you can use the IBM i command, CHGAUT. However, when you remove some object authorities, the UNIX-like application might not work as you expect it to work.

Creating a stream file with the open() or creat() API
When you use the creat() API to create a stream file, you can specify the data authorities for the owner, the primary group, and public (using the UNIX-like authorities of *R, *W, and *X).

The system uses the information in the parent directory to set the object authorities for the owner, primary group, and public. You can also specify these authorities when you use the open() API to create a stream file. Alternatively, when you use the open() API you can specify that the object should inherit all authorities from the parent directory, which is called inherit mode. When you specify inherit mode, the system then creates a complete match for the parent authorities, including authorization list, primary group, public authority, and private authorities. This option works like specifying *INDIR on the CRTDIR command.

Creating an object by using a PC interface
You can use the creat() API to create a stream file.

When you use the creat() API to create a stream file, you can specify the data authorities for the owner, the primary group, and public (using the UNIX-like authorities of *R, *W, and *X).

QFileSvr.400 file system
With the QFileSvr.400 file system, a user (USERX) on one IBM i platform (SYSTEMA) can access data on another connected IBM i platform (SYSTEMB).

The USERX has an interface that is just like the Client Access interface. The remote system (SYSTEMB) appears as a directory with all its file systems as subdirectories. When USERX attempts to access SYSTEMB with this interface, SYSTEMA sends USERX's user profile name and encrypted password to SYSTEMB. The same user profile and password must exist on SYSTEMB or SYSTEMB rejects the request. If SYSTEMB accepts the request, USERX appears to SYSTEMB just like any Client Access user. The same authority-checking rules apply to any actions that USERX attempts.

As a security administrator, you need to be aware that the QFileSvr.400 file system represents another possible door to your system. You cannot assume that you are limiting your remote users to an interactive sign on with display station pass-through. If you have the QSERVER subsystem running and your system is connected to another IBM i platform, remote users can access your system as if they are on a local PC running Client Access. More than likely, your system will have a connection that needs to have the QSERVER subsystem running. This is yet another reason why a good object authority scheme is essential.

Network file system (NFS)
The Network File System (NFS) provides access to and from systems that have NFS implementations.

NFS is an industry-standard method for sharing information among users on networked systems. Most major operating systems, including PC operating systems, provide NFS. For UNIX systems, NFS is the primary method for accessing data. IBM i product can act as both an NFS client and an NFS server.

When you are the security administrator of an IBM i platform that acts as an NFS server, you need to understand and manage the security aspects of NFS. Suggestions and considerations:

- You must explicitly start the NFS server function by using the STRNFSSVR command. Control who has authority to use this command.
- You make a directory or an object available to NFS clients by exporting it. Therefore, you have very specific control over which parts of your system you will make available to NFS clients in your network.
- When you export, you can specify which clients have access to the objects. You identify a client by system name or IP address. A client can be an individual PC or an entire IBM i product or UNIX system. In NFS terminology, the client's IP address is called a machine.
- When you export, you can specify read-only access or read/write access for each machine that has access to an exported directory or object. In most cases, you will probably want to provide read-only access.
- The NFS does not provide password protection. It is designed and intended for data sharing within a trusted community of systems. When a user requests access, the server receives the user's user identification number (uid). Some uid considerations are:
  - The IBM i product attempts to locate a user profile with the same uid. If it finds a matching uid, it uses the credentials of the user profile. Credentials is an NFS term to describe using the authority of a user. This is similar to profile exchanging in other IBM i applications.
  - When you export a directory or object, you can specify whether you will allow access by a profile with root authority. The NFS server on IBM i products equates root authority to *ALLOBJ special authority. If you specify that you will not allow root authority, an NFS user with a uid that maps to a user profile with *ALLOBJ special authority will not be able to access the object under that profile. Instead, if anonymous access is allowed, the requester will be mapped to the anonymous profile.
  - When you export a directory or object, you can specify whether you will allow anonymous requests. An anonymous request is a request with a uid that does not match any uid on your system. If you choose to allow anonymous requests, the system maps the anonymous user to the IBM-supplied

QNFSANON user profile. This user profile does not have any special authorities or explicit authority. On the export, you can specify a different user profile for anonymous requests if you want.

- When your system participates in an NFS network, or any network with UNIX systems that depend on uids, you probably need to manage your own uids instead of letting the system assign them automatically. You will need to coordinate uids with other systems in your network.

  You might discover that you need to change uids, even for IBM-supplied user profiles, to have compatibility with other systems in your network. When you change the uid for a user profile, you also need to change the uid for all the objects that the profile owns in the root (/), QOpenSys, or user-defined file systems. The QSYCHGID API can be used to change the uid of the user profile and it will automatically update the uid of all the objects owned by that profile.

Planning security for logical partitions

Use this information to plan security for logical partitions (LPARs) on your servers.

Logical partitions allow you to distribute resources within a single server to make it function as if it were two or more independent servers. Each logical partition operates as an independent logical server. However, each partition shares a few physical system attributes such as the system serial number, system model, and processor feature code.

The security-related tasks that you perform on a partitioned system are the same as on a system without logical partitions. However, when you create logical partitions, you work with more than one independent system. Therefore you must perform the same tasks on each logical partition instead of just once on a system without logical partitions.

See "Manage security for logical partitions" under Systems Management.

Planning operations console security

Operations Console allows you to use your PC to access and control your system. It is important to include Operations Console in your overall security plan.

You can do any tasks that you can do from a traditional console from Operations Console. For example, user profiles that have *SERVICE or *ALLOBJ special authority are able to sign on to the Operations Console session, even if they are disabled.

Operations Console uses Service Tools User Profiles and passwords to enable the connection to the IBM i platform. This makes it especially important to change your Service Tools User Profiles and passwords. Hackers are likely to be familiar with the default Service Tools User Profiles userids and passwords, and can use them to attempt a remote console session to your IBM i platform. See "Changing known passwords" on page 86 and "Avoiding default passwords" on page 86 for tips on passwords.

Planning printer and printer output queue security

Here are several key points in planning security for the printer and printer output queue, the importance of the planning tasks, and recommendations for completing the tasks.

Review the printer portion of your Physical Security Plan. Fill in the output queue section of the Printer Output and Workstation Security form as you work through this topic. You also need a plan to protect confidential information while it is printing or waiting to print. Check your Physical Security Plan for printers that your company uses for confidential output. After you plan printer output queue security, you can plan security for workstations.

The basic printing process involves:

- A copy of the report to be printed is held in a spooled file or printer output.
- The spooled file is stored in an object called an output queue until a printer is available.
- Spooling makes it easier to schedule printer jobs and to share printers.
- Spooling helps you protect confidential output.

You can create one or more special output queues to hold confidential output and restrict who can view and manage those output queues.

- To secure the special output queue, use these commands:
  - Work with Output Queue Description (WRKOUTQD)
  - Create Output Queue (CRTOUTQ)
  - Change Output Queue (CHGOUTQ)
- On these commands, you can specify values for these key parameters:
  - DSPDTA
  - AUTCHK
  - OPRCTL

When you run a program that prints a report, the report typically does not go directly to a printer. The program creates a copy of the report, called a spooled file or printer output. The system stores the spooled file in an object called an output queue until a printer is available. When the output queue contains printer output, you can view the report at your workstation. You can also hold it or direct it to a specific printer.

Spooling makes it easier to schedule printing jobs and to share printers. Spooling also helps you protect confidential output. You can create one or more special output queues to hold confidential output and restrict who can view and manage those output queues. You can also control when confidential output is sent from the queue to a printer. Complete the Printer Output and Workstation Security form as you work through this topic.

When you create a special output queue, you can specify several parameters that relate to security:

- **Display Data (DSPDTA) Parameter:** The DSPDTA parameter of an output queue determines whether a user can view, send, or copy a spooled file that another user owns.
- **Authority to Check (AUTCHK) Parameter:** The AUTCHK parameter specifies what type of authorities to the output queue allow the user to control all the files on the queue. Users with some special authority may also be able to control the files:
  - ***OWNER:** The requester must have ownership authority to the output queue in order to pass the output queue authorization test. The requester can have ownership authority by being the owner of the output queue, or sharing a group profile with the queue owner, or running a program that adopts the owner's authority.
  - ***DTAAUT:** Any user with add, read, and delete authority to the output queue can control all spooled files on the queue.
- **Operator Control (OPRCTL) Parameter:** The OPRCTL parameter of an output queue determines whether users with *JOBCTL special authority or *SYSOPR user class are allowed to control the output queue, provided that the profile was created with *SYSOPR user class, and that the special authorities parameter was set to *USRCLS and has not been changed.

The output queue parameters, the user's authority to the output queue, and the user's special authority work together to determine the functions a user can perform on spooled files in an output queue. You can perform the following printing functions with spooled files:

- Add spooled files to the queue.
- View a list of spooled files (WRKOUTQ command).
- Display, copy, or send spooled files (DSPSPLF, CPYSPLF, SNDNETSPLF, and SNDTCPSPLF commands).
- Change, delete, hold, or release spooled files (CHGSPLFA, DLTSPLF, HLDSPLF, and RLSSPLF commands).
- Change, clear, hold, and release output queue (CHGOUTQ, CLROUTQ, HLDOUTQ, and RLSOUTQ commands).

For more information about the printing commands, see the following tables in Security reference:

Output queue commands

Securing spooled files

Most information that is printed on your system is stored as a spooled file on an output queue while it is waiting to print. Unless you control the security of output queues on your system, unauthorized users can display, print, and even copy confidential information that is waiting to print.

One method for protecting confidential output is to create a spooled file. For more information about parameters that control the security of a spooled file, refer to the following topics in the Printing topic in Security reference

- Display Data (DSPDTA) parameter of output queue
- Authority to Check (AUTCHK) parameter of output queue
- Operator Control (OPRCTL) parameter of output queue
- Output queue and parameter authorities required for printing

Related concepts

Securing your printer output queue
Your need to control which users have access to printer output queue and what types of access they have.

Related information

Spooled Files
Printing

Printer output queue security worksheet

Complete this worksheet as part of your printer output queue security.

Table 25. Printer output queue and workstation security worksheet				
Printer output queue and workstation security worksheet				
Prepared by:		Date:		
Instructions				
• Make an entry on this worksheet for any workstation or output queue that requires special protection.				
List the parameters for restricted output queues				
Output queue name	Output queue library	Display any file (DSPDTA)	Authority to check (AUTCHK)	Operator control (OPRCTL)
Security officer workstations: If you limit the security officer to specific workstations, by setting the system value QLMTSECOFR is yes, list below the workstations authorized for the security officer and anyone with *ALLOBJ authority				
List below the authorities for restricted workstations				
Workstation name	Groups or users who are authorized (*CHANGE authority)			

Table 25. Printer output queue and workstation security worksheet (continued)
Printer output queue and workstation security worksheet
Note: Restricted workstations should have public authority set to *EXCLUDE.

Related concepts

Implementing resource security

This information helps you establish resource security for workstations and printers by setting ownership and public authority to objects, as well as specific authority to applications.

Planning workstation resource security

After planning resource security for printers and printer output, use this topic to begin planning workstation security.

On your Physical Security Plan, you listed workstations that represent a security risk because of their location. Use this information to determine which workstations you need to restrict.

You can encourage the people who use these workstations to be particularly aware of security. They should sign off whenever they leave their workstations. You may want to record your decision about sign off procedures for vulnerable workstations in your security policy. You can also limit which functions can be performed at those workstations to minimize the risks.

The easiest method for limiting function at a workstation is to restrict it to user profiles with limited function. You may choose to prevent people with security officer or service authority from signing on at every workstation. If you use the QLMTSECOFR system value to do this, people with security officer authority can sign on only at specifically authorized workstations.

Prepare the workstation portion of the Output queue and workstation security form. You should also review a list of resource security recommendations to ensure that your resource security plan is simple and complete. After you have reviewed the example and the recommendations you can begin planning your application installation.

Workstation security worksheet
Complete this worksheet as you develop your workstation security plan.

Table 26. Workstation Security worksheet	
Workstation Security worksheet	
Prepared by:	Date:
Instructions	
• Make an entry on this worksheet for any workstation that requires special protection.	
Security officer workstations:	
If you limit the security officer to specific workstations (system value QLMTSECOFR is yes), list below the workstations authorized for the security officer and anyone with *ALLOBJ authority:	
List below the authorities for restricted workstations:	
Workstation name	Groups or users who are authorized (*CHANGE authority)
Note: Restricted workstations should have public authority set to *EXCLUDE.	

Planning security for programmers

Programmers pose a problem for the security officer. Their knowledge makes it possible for them to bypass security procedures that are not carefully designed.

For guidelines when setting up an environment for application programmers, refer to Planning security for programmers in the Security reference topic.

Planning network security

When connecting to an untrusted network, your security policy must describe a comprehensive security scheme, including the security measures that you will carry out at the network level.

Installing a firewall is one of the best means of deploying a comprehensive set of network security measures. Also, your Internet Service Provider (ISP) can and should provide an important element in your network security plan. Your network security scheme should outline what security measures your Internet Service Provider (ISP) will provide, such as filtering rules for the ISP router connection and public Domain Name Service (DNS) precautions. Continue to check with your ISP periodically to ensure they are continually upgrading their security measures, this will also help you keep your security plans current.

Although a firewall certainly represents one of your main lines of defense in your total security plan, it should not be your only line of defense. Because Internet security risks occur at a variety of levels, you need to set up security measures that provide multiple layers of defense against these risks.

While a firewall provides a tremendous amount of protection from certain kinds of attack, a firewall is only part of your total security solution. For instance, a firewall cannot necessarily protect data that you send over the Internet through applications such as SMTP mail, FTP, and TELNET. Unless you choose to encrypt this data, anyone on the Internet can access it as it travels to its destination.

Choosing network security options

Network security solutions that guard against unauthorized access generally rely on firewall technologies to provide the protection. To protect your system, you can choose to use a full-capability firewall product or you can choose to put into effect specific network security technologies as part of the IBM i TCP/IP implementation. This implementation consists of the Packet rules feature, which includes IP filtering and NAT, and the HTTP for IBM i proxy server feature.

Choosing to use either the Packet rules feature or a firewall depends on your network environment, access requirements, and security needs. You should strongly consider using a firewall product as your main line of defense whenever you connect your system or your internal network to the Internet or other untrusted network.

A firewall is preferable in this case because a firewall typically is a dedicated hardware and software device with a limited number of interfaces for external access. When you use the IBM i TCP/IP technologies for Internet access protection you are using a general purpose computing platform with a myriad number of interfaces and applications open to external access.

The difference is important for a number of reasons. For example, a dedicated firewall product does not provide any other functions or applications beyond those that comprise the firewall itself. Consequently, if an attacker successfully circumvents the firewall and gains access to the system, the attacker cannot do much. Whereas, if an attacker circumvents the TCP/IP security functions on your system, the attacker potentially can have access to a variety of useful applications, services, and data. The attacker can then use these to wreck havoc on the system itself or to gain access to other systems in your internal network.

So, is it ever acceptable to use the TCP/IP security features? As with all the security choices that you make, you must base your decision on the cost versus benefit trade-offs that you are willing to make. You must analyze your business goals and decide what risks you are willing to accept versus the cost of how you provide security to minimize these risks. The following table provides information about when it is appropriate to use TCP/IP security features versus a fully functional firewall device. You can use this table to determine whether you should use a firewall, TCP/IP security features, or a combination of both to provide your network and system protection.

Security technology	Best use of IBM i TCP/IP technology	Best use of a fully functional firewall
IP packet filtering	• To provide additional protection for a single system, such as a public web server or an intranet system with sensitive data. • To protect a subnetwork of a corporate intranet when the system is acting as a gateway (casual router) to the rest of the network. • To control communication with a somewhat trusted partner over a private network or extranet where the system is acting as a gateway.	• To protect an entire corporate network from the Internet or other untrusted network to which your network is connected. • To protect a large subnetwork with heavy traffic from the remainder of a corporate network.
Network address translation (NAT)	• To enable the connection of two private networks with incompatible addressing structures. • To hide addresses in a subnetwork from a less trusted network.	• To hide addresses of clients accessing the Internet or other untrusted network. To use as an alternative to Proxy and SOCKS servers. • To make services of a system in a private network available to clients on the Internet.
Proxy server	To proxy at remote locations in a corporate network when a central firewall provides access to the Internet.	To proxy an entire corporate network when accessing the Internet.

Related information

Network security options

Planning network attributes

If you have primarily Windows servers on your network, you can simplify working with those servers by changing default values on a system-wide basis.

Many network server commands, such as WRKNWSENR and WRKNWSSTS, allow you to specify *NWSA for a given parameter to indicate that the server should use information from the network server attributes.

For example, if you plan to enroll most of your users to the same domain, you can simplify enrollment by first defining a default list of those domains. Then when you enroll users, you can refer to that list of default attributes by specifying *NWSA on the appropriate command parameters. Adding or removing network servers is also simpler because you change the default server list instead of manually changing all the profiles that refer to it.

To set these attributes on an individual user profile basis instead, you can use the **CHGNWSUSRA** command. Network server attributes are saved by the Save System (**SAVSYS**) command. Network server attributes are restored to the system when the operating system is installed.

Network attributes describe the local system name, the default local location name, the default control point name, the local network identifier, and the network node type. If the machine is an end node, the attributes also contain the names of the network servers that are used by this system. Network attributes also determine whether the system uses HPR, or whether you want to use virtual controllers for APPN.

The Change Network Attributes (**CHGNETA**) command is used to set the attributes for the system within the network. The following attributes are defined for DISTRIB and these attributes apply to all connections in the network for this end node.

The network server user attributes preserve network information for a group or user profile. Many of the administrative commands use some of this information, such as the default server type. The network server user attributes also contain a list of servers and domains, and associated user information that are used by the user enrollment support to enroll the user or group on Windows. You can set defaults for this same information on a system-wide basis by using the Change Network Server Attribute (**CHGNWSA**) command. To specify these attributes on an individual or group profile basis and enroll server users to Windows servers, you use the **CHGNWSUSRA** command. You use these attributes to specify the server or domain names on which you want to enroll users.

Related information

Change network attributes

Change the network attributes (Distribution)

System objects attributes

Planning Advanced Program-to-Program Communication security

Use this information to understand how Advanced Program-to-Program Communication (APPC) works and how you can set up the appropriate security for APPC on your system.

APPC allows programs on IBM i to communicate with programs on other systems having compatible communications support. Display station pass-through, distributed data management, and personal computers can use APPC.

When your system participates in a network with other systems, a new set of doors and windows to your system becomes available. As security administrator, you should be aware of the options that you can use to control the entrances to your system in an APPC environment.

Tip: Many methods for connecting PCs to your system servers depend on communications, such as APPC or TCP/IP. Be sure to consider the security issues for connecting to both other systems and to PCs. When you plan your network protection, make sure that you do not adversely affect the PCs that are attached to your system.

Related information

APPC Programming PDF

APPC, APPN, and HPR PDF

Example: A basic APPC session

In an APPC environment, when a user or application on one system requests access to another system, the two systems set up a session. To establish the session, the systems must link two matching APPC device descriptions.

The remote location name (RMTLOCNAME) parameter in the SYSTEMA device description must match the local location name (LCLLOCNAME) parameter in the SYSTEMB device description and vice versa. For the two systems to establish an APPC session, the location passwords in the APPC device descriptions on SYSTEMA and SYSTEMB must be identical. Both must specify *NONE, or both must specify the same value.

If the passwords are a value other than *NONE, they are stored and transmitted in encrypted format. If the passwords match, the systems establish a session. If the passwords do not match, the user's request is rejected.

Basic elements of APPC

Advanced Program-to-Program Communication (APPC) provides the ability for a user on one system to perform work on another system.

The system from which the request starts is called any of the following names: **source system**, **local system**, or **client**.

The system that receives the request is called any of the following names: **target system**, **remote system**, or **server**.

From the perspective of a security administrator, the following must happen before a user on one system (SYSTEMA) can perform meaningful work on another system (SYSTEMB):

- The source system (SYSTEMA) must provide a path to the target system (SYSTEMB). This path is called an **APPC session**.
- The target system must identify the user and associate the user with a user profile. The target system must support the encryption algorithm of the source system.
- The target system must start a job for the user with an appropriate environment (work management values).

The security administrator on the target system has primary responsibility for ensuring that APPC users do not violate security. However, when the security administrators on both systems work together, the job of managing APPC security is much easier.

APPC user access to the target system

Several elements combine to determine how an Advanced Program-to-Program Communication (APPC) user gains entrance to the target system.

When the systems establish the APPC session, they create a path for the requesting user to get to the door of the target system. The server associates a user ID with a request for an APPC session. The architected security values determine what the user must do to gain entrance to the other system.

Architected security values

Advanced Program-to-Program Communications (APPC) architecture provides three methods for sending security information about a user from the source system to the target system. These methods are referred to as the architected security values.

The Security values in the APPC architecture table shows the security values in the APPC architecture:

Table 27. Security values in the APPC architecture		
Architected security value	**User ID set to target system**	**Password sent to target system**
None	No	No
Same	Yes[1]	See note 2.
Program	Yes	Yes[3]
Note:		
1. The source system sends the user ID if the target system specifies SECURELOC(*YES) or SECURELOC(*VFYENCPWD).		
2. The user does not enter a password on the request because the password is already verified by the source system. For SECURELOC(*YES) and SECURELOC(*NO), the source system does not send the password. For SECURELOC(*VFYENCPWD), the source system retrieves the stored, encrypted password and sends it, in encrypted form.		
3. The system sends the password in encrypted form if both the source and target systems support password encryption. Otherwise, the password is not encrypted.		

The application that you request determines the architected security value. For example, SNADS always uses SECURITY(NONE). DDM uses SECURITY(SAME). With display station pass-through, you specify the security value by using parameters on the **STRPASTHR** command.

In all cases, the target system chooses whether to accept a request with the security value that is specified on the source system. In some situations, the target system might reject the request completely. In other situations, the target system might force a different security value. For example, when you specify both a user ID and a password on the STRPASTHR command, the request uses SECURITY(PGM). However, if the QRMTSIGN system value is *FRCSIGNON on the target system, you still see a Sign On display. With the *FRCSIGNON setting, the systems always use SECURITY(NONE), which is the equivalent of the user entering no user ID and password on the **STRPASTHR** command.

The source and target systems negotiate the security value before data is sent. In the situation where the target system specifies SECURELOC(*NO) and the request is SECURITY(SAME), for example, the target system tells the source system to use SECURITY(NONE). The source system does not send the user ID.

The target system rejects a session request when the user's password on the target system has expired. This applies only to connection requests that send a password, which is shown as follows:

- Session requests of type SECURITY(PROGRAM).
- Session requests of type SECURITY(SAME) when the SECURELOC value is *VFYENCPWD.

Related information
APPC Programming PDF

Options for dividing network security responsibility

When your system participates in a network, you must decide whether to trust the other systems to validate the identity of a user who is trying to enter your system.

Will you trust SYSTEMA to ensure that USERA is really USERA (or QSECOFR is really QSECOFR)? Or will you require a user to provide a user ID and password again?

The secure location (SECURELOC) parameter on the APPC device description on the target system specifies whether the source system is a secure, trusted location.

When both systems are running a release that supports *VFYENCPWD, SECURELOC(*VFYENCPWD) provides additional protection when applications use SECURITY(SAME). Although the requester does not enter a password on the request, the source system retrieves the user's password and sends it with the request. For the request to be successful, the user must have the same user ID <u>and</u> password on both systems.

When the target system specifies SECURELOC(*VFYENCPWD) and the source system does not support this value, the target system handles the request as SECURITY(NONE).

Table 28. How the APPC security value and the SECURELOC value work together

Source system	Target system	
Architected security value	SECURELOC value	User profile for job
None	Any	Default user[1]
Same	*NO	Default user[1]
	*YES	Same user profile name as requester from source system
	*VFYENCPWD	Same user profile name as requester from source system. The user must have the same password on both systems.

Table 28. How the APPC security value and the SECURELOC value work together (continued)		
Source system	**Target system**	
Architected security value	**SECURELOC value**	**User profile for job**
Program	Any	The user profiles that are specified on the request from the source system
1. The default user is determined by the communications entry in the subsystem description.		

Security considerations for Internet browsers

While the ability to use a browser to connect to the Internet is a valuable tool for conducting business and research, all Internet connections to your system pose significant security threats.

Many PC users in your organization have browsers on their workstations. They might connect to the Internet or to your server. More information about the security considerations both for the PCs and for your server is available under Planning Internet security in the System Internet security topic.

Risk: Workstation damage

When using the Internet there are potential security risks to workstations. But, there are ways to reduce the risks to your workstation data.

A Web page that your user visits might have an associated program, such as a Java™ applet, an Active-X control, or some other type of plug-in. This type of program when run on a PC has the potential to damage the information on the PC. As a security administrator, consider the following for protecting PCs in your organization:

- Understand the security options of the different browsers that your users have. For example, to prevent Java applets from damaging PC data, you can control the access that Java applets have outside the browser.
- Make recommendations to your users about their browser settings. You must educate users about the potential risks of improper settings.

Risk: Trust signed applets

There are security risks from signed Java applets. Consider these recommendations for reducing these risks as you plan your system security.

Your users might have followed your advice and set up their browsers to prevent applets from writing to any PC drives. However, your PC users need to be aware that a signed applet can override the setting for their browser.

A signed applet has an associated digital signature to establish its authenticity. When a user accesses a Web page that has a signed applet, the user sees a message. The message indicates the applet's signature, who signed it and when it was signed. When your user accepts the applet, the user grants the applet an override to the security settings for the browser. The signed applet can write to the PC's local drives, even though the default setting for the browser prevents it. The signed applet can also write to mapped drives on your server because they appear to the PC to be local drives.

For your own Java applets that come from your server, you might need to use signed applets. However, instruct your users in not to accept signed applets from unknown sources.

Related information

Java Internet security

Planning TCP/IP security

Transmission Control Protocol/Internet Protocol (TCP/IP) is a common way that computers of all types communicate with each other.

SecureWay describes security considerations when you connect your IBM i platform either to the Internet (a very large TCP/IP network) or to an intranet. Keep in mind that IBM i platform supports many possible TCP/IP applications. When you decide to allow one TCP/IP application on your system, you may also be enabling other TCP/IP applications. As security administrator, you need to be aware of the range of TCP/IP applications and the security implications of these applications.

Related information

Connection to the Internet

TCP/IP

TCP/IP setup

Intrusion detection

TCP/IP security components

You can take advantage of several TCP/IP security components to enhance your network security and add flexibility.

Though some of these technologies are also found in firewall products, these TCP/IP security components for IBM i are not intended to be used as a firewall. However, you may be able to use some of these features, in some instances to eliminate the need for a separate firewall product. You also may be able to use these TCP/IP features to provide additional security in environments where you already use a firewall.

The following components can be utilized to enhance TCP/IP Security:

- Packet Rules
- HTTP Proxy Server
- VPN (virtual private networking)
- SSL (secure sockets layer)

Using packet rules to secure TCP/IP traffic
Packet rules, which are the combination of IP filtering and network address translation (NAT), act like a firewall to protect your internal network from intruders.

IP filtering lets you control what IP traffic to allow into and out of your network. Basically, it protects your network by filtering packets according to rules that you define. NAT, however, allows you to hide your unregistered private IP addresses behind a set of registered IP addresses. This helps to protect your internal network from outside networks. NAT also helps to alleviate the IP address depletion problem, since many private addresses can be represented by a small set of registered addresses.

HTTP proxy server
The HTTP proxy server comes with the IBM HTTP Server for i. The HTTP Server is part of IBM i. The proxy server receives HTTP requests from Web browsers and resends them to Web servers.

Web servers that receive the requests are only aware of the IP address of the proxy server and cannot determine the names or addresses of the PCs that originated the requests. The proxy server can handle URL requests for HTTP, FTP.

The proxy server caches returned Web pages from requests made by all proxy server users. Consequently, when users request a page, the proxy server checks whether the page is in the cache. If it is, the proxy server returns the cached page. By using cached pages, the proxy server is able to serve Web pages more quickly, which eliminates requests to the Web server that might take a long time to process. The proxy server can also log all URL requests for tracking purposes. You can then review the logs to monitor use and misuse of network resources.

You can use the HTTP proxy support in the IBM HTTP Server to consolidate Web access. Addresses of PC clients are hidden from the Web servers they access; only the IP address of the proxy server is known. Web page caching can also reduce communication bandwidth requirements and firewall workload.

Virtual private networking

A virtual private network (VPN) allows your company to securely extend its private intranet over the existing framework of a public network, such as the Internet.

With VPN, your company can control network traffic while providing important security features, such as authentication and data privacy. IBM i VPN function is available on IBM Navigator for i, the graphical user interface (GUI) for IBM i. It allows you to create a secure end-to-end path between any combination of host and gateway. IBM i VPN uses authentication methods, encryption algorithms, and other precautions to ensure that data sent between the two endpoints of its connection remains secure.

VPN runs on the network layer of the TCP/IP layered communications stack model. Specifically, VPN uses the IP Security Architecture (IPSec) open framework. IPSec provides base security functions for the Internet, as well as furnishes flexible building blocks from which you can create reliable, secure virtual private networks. VPN also supports Layer 2 Tunnel Protocol (L2TP) VPN solutions. L2TP connections, which are also called virtual lines, provide cost-effective access for remote users by allowing a corporate network server to manage the IP addresses assigned to its remote users. Further, L2TP connections provide secure access to your system or network when you protect them with IPSec.

It is important that you understand the effect a VPN will have on your entire network. Correct planning and implementation are essential to your success. You should review the VPN topic in the IBM i Information Center to ensure that you know how VPNs work and how you might use them.

Secure sockets layer

Secure Sockets Layer (SSL) has become an industry standard used to enable applications for secure communication sessions over an unprotected network, such as the Internet.

The SSL protocol establishes a secure connection between client and server applications which provide authentication of one or both endpoints of the communication session. SSL also provides privacy and integrity of the data that client and server applications exchange.

Related information

Secure Sockets Layer

Securing your TCP/IP environment

There are steps you can take to reduce the security exposures in the TCP/IP environment on your system.

These tips apply to your entire TCP/IP environment rather than to the specific applications that are discussed in the next topics:

- When you write an application for a TCP/IP port, make sure that the application is properly secure. You should assume that an outsider will try to access that application through that port. A knowledgeable outsider can attempt to TELNET to that application.

- Monitor the use of TCP/IP ports on your system. A user application that is associated with a TCP/IP port can provide "back-door" entry to your system without a user ID or a password. Someone with sufficient authority on your system can associate an application with a TCP or UDP port.

- As a security administrator, you should be aware of a technique called IP spoofing that is used by hackers. Every system in a TCP/IP network has an IP address. Someone who uses IP spoofing sets up a system (typically a PC) to pretend to be an existing IP address or a trusted IP address. Thus, the imposter can establish a connection with your system by pretending to be a system that you normally connect with.

  If you run TCP/IP on your system and your system participates in a network that is not physically protected, such as all nonswitched lines and predefined links, you are vulnerable to IP spoofing. To protect your system from damage by a "spoofer," start with the suggestions in this chapter, for example, sign-on protection and object security. You should also ensure that your system has reasonable auxiliary storage limits set. This prevents a spoofer from flooding your system with mail or spooled

files to the point that your system becomes inoperable. In addition, you should regularly monitor TCP/IP activity on your system. If you detect IP spoofing, you can try to discover the weak points in your TCP/IP setup and to make adjustments.

For your intranet, your company's private network of systems that do not need to connect directly to the outside, use IP addresses that are reusable. Reusable addresses are intended for use within a private network. The Internet backbone does not route packets that have a reusable IP address. Therefore, reusable addresses provide an added layer of protection inside your firewall. TCP/IP Setup provides more information about how IP addresses are assigned and about the ranges of IP addresses, as well as security information about TCP/IP.

Controlling which TCP/IP servers start automatically
As security administrator, you need to control which TCP/IP applications start automatically when you start TCP/IP.

Commands for starting and ending TCP/IP and servers

Two commands are available for starting TCP/IP. For each command, the system uses a different method to determine which applications or servers to start.

STRTCP *Start TCP/IP*
> The default behavior of starting TCP/IP is to start every server that specifies AUTOSTART(*YES). This behavior is controlled by the Start application servers (STRSVR) parameter of the STRTCP command. Security recommendations:
>
> - Assign *IOSYSCFG special authority carefully to control who can change the autostart settings.
> - Carefully control who has authority to use the STRTCP command. The default public authority for the command is *EXCLUDE.
> - Set up object auditing for the Change TCP/IP Server (CHGTCPSVR) and any server-specific commands (such as CHGTELNA) to monitor users who attempt to change the AUTOSTART value for a server.

ENDTCP *End TCP/IP*
> Ending TCP/IP causes all TCP/IP communications and servers to end. Security recommendations:
>
> - Carefully control who has authority to use the ENDTCP command. The default public authority for the command is *EXCLUDE.
> - Prevent the accidental ending of TCP/IP, by using the ENDTCP confirmation support. Either add the QIBM_ENDTCP_CONFIRM environment variable and set it to 'Y' or use the change command default (CHGCMDDFT) command: `CHGCMDDFT CMD(ENDTCP) NEWDFT('CONFIRM(*YES)')`

STRTCPSVR *Start TCP/IP Server*
> A parameter is used to specify which servers to start. The shipped default for this parameter is to start all servers. Security recommendations:
>
> - Use the Change Command Default (CHGCMDDFT) command to set up the STRTCPSVR command to start only a specific server, which does not prevent users from starting other servers. However, by changing the command default, it is less likely users will start all servers by accident. For example, use the following command to set the default to start only the TELNET server: `CHGCMDDFT CMD(STRTCPSVR) NEWDFT('SERVER(*TELNET)')`
>
>   **Note:** When you change the default value, you can specify only a single server. Choose either a server that you use regularly or a server that is least likely to cause security exposures, such as trivial file transfer protocol (TFTP).
> - Carefully control who has authority to use the STRTCPSVR command. The default public authority for the command is *EXCLUDE.

Table 29. System startup values worksheet		
Server	**Default value**	**Your value**
Telnet	AUTOSTART(*YES)	
FTP (file transfer protocol)	AUTOSTART(*YES)	
BOOTP (bootstrap protocol)	AUTOSTART(*NO)	
TFTP (trivial file transfer protocol	AUTOSTART(*NO)	
REXEC (remote EXECution server)	AUTOSTART(*NO)	
RouteD (route daemon)	AUTOSTART(*NO)	
SMTP (simple mail transfer protocol)	AUTOSTART(*YES)	
POP (post office protocol)	AUTOSTART(*NO)	
HTTP (hypertext transfer protocol)[1]	AUTOSTART(*NO)	
LPD (line printer daemon)	AUTOSTART(*YES)	
SNMP (simple network management protocol)	AUTOSTART(*YES)	
DNS (domain name system)	AUTOSTART(*NO)	
DHCP (dynamic host configuration protocol)	AUTOSTART(*NO)	
INETD	AUTOSTART(*NO)	
1. With the IBM HTTP Server, you use the CHGHTTPA command to set the AUTOSTART value.		

Note: Refer to the Start TCP/IP Server (STRTCPSVR) command for a complete list of system-supplied servers.

In addition to the system-supplied servers, it is also possible to add user-defined servers to the list of servers that can be auto-started. User-defined servers are managed using the Add TCP/IP Server, Change TCP/IP Server, and Remove TCP/IP Server command. Carefully control who has authority to these commands since they are shipped with a default public authority of *USE. Carefully consider controlling the End TCP/IP Server command even though it is shipped with a default public authority of *EXCLUDE.

Monitoring TCP/IP processing
System-supplied TCP/IP server jobs typically run in the QSYSWRK subsystem. However, user-defined TCP/IP servers can run in the QUSRWRK subsystem or even in application provided subsystems. If you have user-defined servers running on your system, be aware of the subsystems and other system resources that they use.

If you suspect that someone is starting or ending TCP/IP or servers unnecessarily, you can set up object auditing on the appropriate TCP/IP or server-related command. The system writes an audit journal entry whenever a user runs the command.

Using the Secure Shell (SSH) to secure your applications

You can set up the Secure Shell (SSH) to ensure the security of applications that run on the TCP/IP network.

TCP/IP connectivity applications, such as Telnet and FTP transmit data and passwords over the network in plain text. This means that the data and passwords can be intercepted and read by other users on the network.

The Secure Shell (SSH) protocol suite provides secure alternatives for Telnet and FTP. SSH verifies the authenticity of both the client and server. All of the data, including userids and passwords, is encrypted as it travels on the network.

Related information

Portable Utilities for IBM i

Planning backup and recovery of security information

The backup and recovery of your security information is an essential part of your system security plan. Saving your security information is just as important as saving your data.

In some situations, you may need to recover user profiles, object authorities, and the data on your system. If you do not have your security information saved, you may need to manually rebuild user profiles and object authorities. This can be time-consuming and can lead to errors and security exposures. Planning adequate backup and recovery procedures for security information requires understanding how the information is stored, saved, and restored.

Security information is stored differently on the save media than it is on your system. When you save user profiles, the private authority information stored with the user profile is formatted into an authority table. An authority table is built and saved for each user profile that has private authorities. This reformatting and saving of security information can be lengthy if you have many private authorities on your system.

Related information

Recovering your system
Backup and recovery of security information

Implementing your security strategy

This topic describes the tasks for implementing your security strategy, explains why they are important, and provides links to the implementation topics.

This topic guides you through the tasks necessary to implement your security strategy. If you are setting up a new system, you should complete these steps in sequence. The system uses information from each step as you proceed to the next step. Setting up basic system security involves defining your user security, setting up system-level security, protecting your resources on the system, and setting up network security. The tables below highlight each of the steps you must configure to set up user and resource security.

Before you begin

If you are installing a new system, do these things before you start setting up security:

1. Make sure your system unit and your devices are installed and working properly. If you do not plan to use system naming for your devices, wait to attach your workstations and printers until after you change the system value that determines how devices are named (QDEVNAMING). Applying the new system values tells you when to attach the devices.

2. Load any licensed programs you plan to use.

Note: You *must* complete all the steps to set up user security before you begin setting up resource and network security.

Table 30. Steps in setting up system security

Step	What you do in this step	What worksheets you use
Set up your user environment.	Set up initial system values and network attributes.	System values selection
Set up system-level security	Set up additional system values.	Using System Security (QSECURITY) system value

Table 31. Steps in setting up resource security

Step	What you do in this step	What worksheets you Uuse
Set up ownership and public authority	Establish ownership and public authority for libraries and objects.	Application installation
Create an authorization list	Create authorization lists.	Authorization list
Set up specific authority for objects and libraries	Set up access to libraries and individual objects.	Library description
Secure your printer output queue	Protect printer output by creating output queues and assigning output.	Output queue and workstation security
Secure your workstations	Protect workstations.	Output queue and workstation security

Table 32. Steps in Setting Up Network Security

Step	What you do in this step	What reference you use
Save security information	Save system values, group and user profiles, job descriptions, and resource security information.	Recovering your system
Restore security information	Restore system values, user profiles, objects, authority, programs, authorization lists, and the operating system.	Recovering your system
Set up network security	Set up network security for APPC, and TCP/IP applications.	Setting up Network Security

Setting up your user environment

There are several steps necessary to set up your user environment and sign on to the system.

To begin setting up user security, you need to set up the overall environment for your users. Use the SETUP menu to set system values, and create your own user profile. You also need to change user IDs and passwords for the Dedicated Service Tools (DST) profiles.

In the following procedures, you will find example command-line screens that illustrate these steps. However, these examples do not show the entire screen. They show only the information necessary to complete the task.

What forms are needed?

Use information from the system values selection worksheet that you prepared in Planning your security strategy as you complete these tasks to set up your overall environment:

1. "Signing on to the system" on page 82
2. "Selecting the right assistance level" on page 82
3. "Preventing others from signing on" on page 82
4. "Enter sign-on system values for security" on page 83
5. "Applying the new system values" on page 85
6. "Creating a security officer profile" on page 85

Signing on to the system

To begin setting up your system environment, you need to sign on to the system.

1. At the console, sign on as the security officer (QSECOFR). If you are signing on for the first time, use the password QSECOFR. Because the system ships this password as expired, the system will prompt you to change this password. You must change this password to successfully sign on. Remember to record your password and store it in a secure place.
2. Enter SETUP in the Menu field on the Sign On display.

Note: The SETUP menu is called the Customize Your System, Users, and Devices menu. This text refers to it as the SETUP menu throughout.

```
                    Sign On
                              System . . . . .
                              Subsystem . . . .
                              Display . . . . .
User . . . . . . . . . . . . . .   QSECOFR
Password . . . . . . . . . . . .   _____
Program/procedure . . . . . . .   _____
Menu . . . . . . . . . . . . . .   SETUP
Current library . . . . . . . .   _____
```

Selecting the right assistance level

After signing on to the system, you can choose the appropriate assistance level for users. The assistance level determines what version of a display you see. Many system displays have two different versions to choose from:

- A basic assistance level version, which contains less information and does not use technical terminology.
- An intermediate assistance level version, which shows more information and uses technical terms.

Some fields or functions are available only on a particular version of a display. The instructions tell you which version to use. To change from one assistance level to another, use F21 (Select assistance level). F21 is not available from all displays. After you select your assistance level, you must prevent others from signing on to the system while you set up security.

Preventing others from signing on

After you select the right assistance level, you must prevent anyone else from signing on to the system. If you are concerned about people tampering with your system before you have a chance to secure it, you have the option of preventing anyone else from signing on at another workstation. Prevent additional users from signing on only if you feel that temporary security is necessary:

1. From the SETUP menu, press F9 to display a command line.
2. On the command line, type: GO DEVICESTS
3. The screen shows the Device Status Tasks menu. If you see the Work with Configuration Status menu, use F21 (Select assistance level) to change to basic assistance level.
4. Select option 1 Work with display devices.
5. On the Work with Display Devices display, make all the workstations except the one you are using unavailable. Do this by typing 2 in front of each workstation name and pressing the Enter key.
6. Return to the SETUP menu by pressing F3 (Exit) twice.
7. Press F12 (Cancel) to remove the command line.

```
            Work with Display Devices

Type options below, then press Enter.
   1=Make available   2=Make unavailable  5=Display
   7=Display message  8=Work with controller and line
   13=Change description

Opt  Device  Type  Status
__    DSP01   3196  QSECOFR
2_  DSP02 3196 Available to use
2_  DSP03 3196 Available to use
2_  DSP04 3196 Available to use
```

When you make a device unavailable, it does not have a Sign On display, even if it is powered on. Workstations stay unavailable only until you stop and start your system again. You may need to repeat this step.

Enter sign-on system values for security

After you have prevented others from signing on, you need to enter system values into the system. Use this procedure to enter the information from Part 1 of your System Values Selection form:

1. From the SETUP menu, select option 1 (Change system options).
2. Enter information from your System Values Selection form on the Change System Options display. If you do not want to change one of the choices on the display, you can use the Tab key to skip over it.
3. Enter the correct date and time on this display, if they were not set when you started the system.
4. After you type the information on this page, page down to the next page.
5. Type your choices on the second page of the display and page down.
6. Type your choices on the third page of the display and press the Enter key.
7. You should see the SETUP menu again. Notice the message at the bottom of your display: `System options successfully changed. IPL required.`

    Note: The system requires an IPL only if you changed the security level.

The Possible errors and recovery steps table describes things that might go wrong, reasons they could have gone wrong, and how to fix the problem. Use these tables for assistance if your results are different from those described.

Table 33. Possible errors and recovery steps

Possible error	Recovery steps
The MAIN menu is displayed.	You pressed F3 (Exit) or F12 (Cancel). Type GO SETUP and try again.
You see another display, such as the Change Cleanup Options display.	You selected the wrong option from the SETUP menu. Press F3 (Exit) to return to the menu and try again.
The Change System Option display is shown again after you press the Enter key.	Look for an error message at the bottom of the display. You probably typed a value that is not allowed. Use F1 (Help) if you need more information. Use F5 (Refresh) if you want the system to restore all the values to what they were before you started typing. Try again.

Table 33. Possible errors and recovery steps (continued)	
Possible error	**Recovery steps**
You pressed the Enter key before you typed all your choices on the display.	You can use this display as many times as necessary to change system values. Select option 1 from the SETUP menu and enter the values you missed the first time. ⚠️ **Attention:** Once your system is operational, do not change the security level without consulting a programmer. Also, do not change the system name if you are using IBM i Access or communicating with another computer.
You pressed the Enter key instead of paging down.	Select option 1 from the SETUP menu again and page down to display the second page. Type your choices and press the Enter key.

The Recommended system value settings table shows several values that you can set to make it more difficult for an unauthorized person to sign on to your system. If you run the CFGSYSSEC command, it sets these system values to the recommended settings.

Table 34. Recommended system value settings		
System Value Name	**Description**	**Recommended Setting**
QAUTOCFG	Whether the system automatically configures new devices.	0 (No)
QAUTOVRT	The number of virtual device descriptions that the system will automatically create if no device is available for use.	0
QDEVRCYACN	What the system does when a device reconnects after an error.[1]	*DSCMSG
QDSCJOBITV	How long the system waits before ending a disconnected job.	120
QDSPSGNINF	Whether the system displays information about previous sign-on activity when a user signs on.	1 (Yes)
QINACTITV	How long the system waits before taking action when an interactive job is inactive.	60
QINACTMSGQ	What the system does when the QINACTITV time period is reached.	*ENDJOB
QLMTDEVSSN	Whether the system prevents a user from signing on at more than one workstation at the same time.	1 (Yes)
QLMTSECOFR	Whether users with *ALLJOB or *SERVICE special authority can sign on only at specific workstations.	1 (Yes)[2]
QMAXSIGN	Maximum consecutive, incorrect sign-on attempts (user profile or password is incorrect).	3

Table 34. Recommended system value settings (continued)		
System Value Name	**Description**	**Recommended Setting**
QMAXSGNACN	What the system does when the QMAXSIGN limit is reached.	3 (Disable both user profile and device)

Note:

1. The system can disconnect and reconnect TELNET sessions when the device description for the session is explicitly assigned.

2. If you set the system value to 1 (Yes), you will need to explicitly authorize users with *ALLOBJ or *SERVICE special authority to devices. The simplest way to do this is to give the QSECOFR user profile *CHANGE authority to specific devices.

For more information, see the Values that are set by the Configure System Security command topic in the Security reference manual.

Applying the new system values

After you enter your system values, you need to apply some of these values. Most changes to system values take effect immediately. However, when you change the security level on your system, the change does not take effect until you stop your system and start it again. After you verify that you typed all the values on the Change System Options display correctly, you are ready to apply the new values.

Note: Attach your workstations to the system, if you have not already done so. When you start the system, it automatically configures those devices using the naming format you chose on the Change System Options display.

Use these steps to stop your system and start it again. When your system starts, the values you entered on the Change System Options display take effect.

1. Make sure you have signed on at the console and that no other workstations are signed on.

2. From the SETUP menu, select the option for Power On and Off Tasks.

3. Select the option to shut down the system immediately and then turn on. Press the Enter key.

4. The system shows a display that requests you to confirm your power-down request. Press F16 (Confirm).

This causes the system to stop and then start again automatically. Your display goes blank for a few minutes. Then you should see the Sign On display again.

Creating a security officer profile

You must create a user profile for yourself after you apply your new system values. A security officer on the system is any user with *SECOFR user class or *ALLOBJ and *SECADM special authorities.

After you apply the system values from the Change System Option display, you must create a user profile for yourself and for the alternate security officer. In the future, use your profile, rather than the QSECOFR profile, when you perform security officer functions.

1. Sign on to the system as QSECOFR and request the SETUP menu. Notice that the system name you chose appears in the upper right of the Sign On display.

2. From the SETUP menu, select the Work with user enrollment option. The Work with User Enrollment display lists the profiles currently on your system. If you see the Work with User Profile display, press F21 (Select assistance level) and change to basic assistance level.

3. To create a new profile, type 1 (Add) in the Opt (option) column and the name of your profile in the User column. Press the Enter key.

4. On the Add User display, assign yourself a password.

5. Fill in the fields shown on the sample display with your own appropriate information.

6. Page down to the next page of the display.

7. Fill in the second page of the display and press the Enter key.

8. Check for confirmation messages at the bottom of the Work with User Enrollment display.

9. Press F3 (Exit) to return to the SETUP menu.

After you create a security officer profile for yourself, you need to change user ID and passwords for Service Tools users.

Related concepts
Applying security system values
Security system values are used to control security on your system.

Related information
Service tools user IDs and passwords
Values that are set by the Configure System Security command

Avoiding default passwords

When you create a new user profile, the default is to make the password the same as the user profile name. When you create new user profiles, consider assigning a unique, non-trivial password instead of using the default password.

Default passwords provide an opportunity for someone to enter your system, if someone knows your policy for assigning profile names and knows that a new person is joining your organization. Tell the new user the password confidentially, such as in a "Welcome to the System" letter that outlines your security policies. Require the user to change the password the first time that the user signs on by setting the user profile to **PWDEXP(*YES)**.

You can use the **Analyze Default Passwords (ANZDFTPWD)** command to check all the user profiles on your system for default passwords. When you print the report, you have the option of specifying that the system should take action (such as disabling the user profile) if the password is the same as the user profile name. The **ANZDFTPWD** command prints a list of the profiles that it found and any action that it took.

Note: Passwords are stored on your system in one-way encrypted form. They cannot be decrypted. The system encrypts the specified password and compares it to the stored password just as it needs to check a password when you sign on to the system. If you are auditing authority failures (*AUTFAIL), the system will write a PW audit journal entry for each user profile that does not have a default password (for systems running V4R1 or earlier releases). Beginning with V4R2, the system does not write PW audit journal entries when you run the **ANZDFTPWD** command.

Changing known passwords

To keep your system secure, change the known passwords for user profiles and dedicated service tools.

Some well-known entrances into the server that may exist on your system, in order to close those entrances

1. Make sure that no user profiles still have default passwords (equal to the user profile name). You can use the Analyze Default Passwords (**ANZDFTPWD**) command.

2. Try to sign on to your system with the combinations of user profiles and passwords that are shown in Table 35 on page 87. These passwords are published, and they are the first choice of anyone who is trying to break into your system. If you can sign on, use the Change User Profile (**CHGUSRPRF**) command to change the password to the recommended value.

3. Start the Dedicated Service Tools (DST) and try to sign on with the passwords that are shown in Table 36 on page 87.

4. If you can sign on to DST with any of these passwords, you should change the passwords.

5. Make sure that you cannot sign on just by pressing the Enter key at the Sign On display without entering a user ID and password. Try several different displays. If you can sign on without entering information about the Sign On display, complete one of these steps:

- Change to security level 40 or 50 (QSECURITY system value). Remember, Your applications might run differently when you increase your security level to 40 or 50.
- Change all of the workstation entries for interactive subsystems to point to job descriptions that specify USER(*RQD).

Table 35. Passwords for IBM-supplied profiles

User ID	Password	Recommended value
QSECOFR	QSECOFR[1]	A nontrivial value known only to the security administrator. **Write down the password that you have selected and store it in a safe place.**
QSYSOPR	QSYSOPR	*NONE[2]
QPGMR	QPGMR	*NONE[2]
QUSER	QUSER	*NONE[2, 3]
QSRV	QSRV	*NONE[2]
QSRVBAS	QSRVBAS	*NONE[2]

Note:

1. 'The system arrives with the *Set password to expired value* for the QSECOFR set to *YES. The first time that you sign on to a new system, you must change the QSECOFR password.

2. The system needs these user profiles for system functions, but you should not allow users to sign on with these profiles. This password is shipped as *NONE. When you run the **CFGSYSSEC** command, the system sets these passwords to *NONE.

3. To run IBM i Access using TCP/IP, the QUSER user profile must be enabled.

Table 36. Passwords for Dedicated Service Tools

DST Level	User ID[1]	Password	Recommended Value
Basic capability	11111111	11111111	A nontrivial value known only to the security administrator.[2]
Full capability	22222222	22222222[3]	A nontrivial value known only to the security administrator.[2]
Security capability	QSECOFR	QSECOFR[3]	A nontrivial value known only to the security administrator.[2]
Service capability	QSRV	QSRV[3]	A nontrivial value known only to the security administrator.[2]

Table 36. Passwords for Dedicated Service Tools (continued)			
DST Level	User ID[1]	Password	Recommended Value
Note:			
1. A user ID is only required for PowerPC® AS (RISC) releases of the operating system.			
2. If your hardware service representative needs to sign on with this user ID and password, change the password to a new value after the hardware service representative leaves.			
3. The service tools user ID will expire as soon as it is used for the first time.			

Important: DST passwords can only be changed by an authenticated device. This is also true for all passwords and corresponding user IDs that are identical. For more information about authenticated devices, see the Operations Console setup information in the IBM i Information Center.

Using system service tools to change passwords

You also can use system service tools (SST) instead of dedicated service tools (DST) to change passwords.

You can manage and create service tools user IDs from system service tools (SST) by selecting option 8 (Work with service tools user IDs) from the main SST display. You no longer need to go into DST to reset passwords, grant or revoke privileges, or create service tools user IDs.

The server is shipped with limited ability to change default and expired passwords. This means that you cannot change service tools user IDs that have default and expired passwords through the Change Service Tools User ID (QSYCHGDS) API, nor can you change their passwords through SST. You can only change a service tools user ID with a default and expired password through DST. You can change the setting to allow default and expired passwords to be changed. Also, you can use the new Start service tools (STRSST) privilege to create a service tools user ID that can access DST, but can be restricted from accessing SST.

Changing passwords for IBM-supplied user profiles

If you need to sign on with one of the IBM-supplied profiles, you can change the password using the **CHGUSRPRF** command. You can also change these passwords using an option from the SETUP menu.

Related information

System values that apply to passwords
Changing passwords for IBM-supplied user profiles

Changing sign-on error messages

Change sign-on error messages to discourages hackers when they are trying to break into your system.

Hackers like to know when they are making progress toward breaking into a system. When an error message on the Sign On display says Password not correct, the hacker can assume that the user ID is correct. You can frustrate the hacker by using the Change Message Description (CHGMSGD) command to change the text for two sign-on error messages. The Sign-on error messages table shows the recommended text.

Table 37. Sign-on error messages		
Message ID	Shipped Text	Recommended Text
CPF1107	CPF1107 – Password not correct for user profile.	Sign-on information is not correct. (Do not include the message ID in the message text.)

Table 37. Sign-on error messages (continued)		
Message ID	**Shipped Text**	**Recommended Text**
CPF1120	CPF1120 – User *xxxxx* does not exist.	Sign-on information is not correct. (Do not include the message ID in the message text.)

Setting up system-level security

The information presented here will guide you through setting the values necessary to carry out your system-level security.

Security system values are used to control security on your system. The Security wizard can automatically configure your system to the correct system value settings for your company.

There are some system values that you can lock down to prevent users from changing these system values during normal operation.

Implementing system security recommendations

Use this procedure to configure your system to the correct system value settings on your IBM i product.

If you are unsure about how to properly set security-related system values or want to examine your current security policy, complete the Security wizard. To protect assets stored on the system, Sampson Organic Produce used the IBM Security Planner, an interactive planning tool that creates a dynamic set of recommendations based on the system environment. You can use the security recommendations in the Security wizard that the administrator for Sampson Organic Produce generated from the Security Planner as an example for implementing your own security settings. You are provided with many options of how to carry out your configuration.

- Automatically configure your system's system values based on the information you provide.
- Save your report so you can configure your system at a later date.
- Print a report that includes the recommended system value settings for your system with the implications of such settings.

To implement security on your system, complete the following steps:

1. In IBM Navigator for i, expand **Security** > **All Tasks**.
2. Click **Configure**.
3. On the Welcome page, click **Next**.
4. Select **Average** to describe your general security policy. Click **Next**.
5. Select **Running business applications** to describe how your system will be used. Click **Next**.
6. Select **No** and click **Next**.
7. Select **No** for your Advanced Program-to-Program Communication (APPC) use and click **Next**.
8. Select **No** to indicate that you are not connecting to the Internet and click **Next**.
9. Select **No** and click **Next**.
10. Select **No** to indicate that you are not using IBM i NetServer. Click **Next**.
11. Select **No** and click **Next** twice.
12. Select **Yes** to audit security-related actions on the system. Click **Next**.
13. Select **Yes** to schedule reports to monitor security on the system. Click **Next**.
14. Select **Once a month** for scheduling these reports. Click **Next**.
15. To review the security recommendations, click **Details**. You can change the security values by clearing the appropriate security control. Click **OK**. Then click **Next**.
16. Specify the directory in which you would like to store the Administrator and User Information Reports. Click **Next**. You can review each of these reports.
17. Click **Next** again.

18. Select **Yes, make changes now** and click **Finish**. You have now completed security configuration on your system.

Applying security system values

Security system values are used to control security on your system.

These values are broken into four groups:

1. General security system values
2. System values that control passwords
3. System values that control auditing
4. Other system values related to security

Deciding which security system values you should use for your business can be perplexing. If you are new to security implementation on servers, or the environment in which you run your server has recently changed, the Security Wizard can help you with decisions.

After you enter your system values, you need to apply some of these values. Most changes to system values take effect immediately. However, when you change the security level on your system, the change does not take effect until you stop your system and start it again. After you verify that you typed all the values on the Change System Options display correctly, you are ready to apply the new values.

Note: Attach your workstations to the system, if you have not already done so. When you start the system, it automatically configures those devices using the naming format you chose on the Change System Options display.

Use the following procedure to stop your system and start it again. When your system starts, the values you entered on the Change System Options display take effect.

1. Make sure you have signed on at the console and that no other workstations are signed on.
2. From the SETUP menu, select the option for Power On and Off Tasks.
3. Select the option to shut down the system immediately and then turn on.
4. Press the Enter key. The system shows a display that requests you to confirm your power-down request.
5. Press F16 (Confirm). This causes the system to stop and then start again automatically.

Your display goes blank for a few minutes, then you should see the Sign On display again. After you apply your new system values, you must create a security officer profile for yourself on the system.

Related concepts

Setting up your user environment
There are several steps necessary to set up your user environment and sign on to the system.

Related reference

Values set by the Configure System Security command
The Configure System Security (**CFGSYSSEC**) command runs a program that is called QSYS/QSECCFGS to activate the system security features by turning on security auditing, changing system values, and modifying system-supplied user profiles. These features can also be customized as required.

Related information

System value finder

Locking down system values

There are some system values that you can lock down to prevent users from changing these system values during normal operation.

Most security system values can be altered only by a user with Security administrator (*SECADM) and All object (*ALLOBJ) special authorities. To prevent even these users from changing these system values

during normal operation, system service tools (SST) and dedicated service tools (DST) provide an option to lock these security values.

Related information

Lock function of security-related system values

Setting up user security

You need to set up security for every person who will be authorized to use your system. User security set up involves installing application libraries, and setting up user groups and profiles.

Several tasks are necessary to set up user security on your system by using the command line interface. The Setting up user security table highlights each of the steps involved in setting up user security.

Table 38. Steps in setting up user security

Step	What you do in this step	What worksheets you use
Load applications	• Create owner profiles. • Load your applications. • Application libraries and objects should be on the system before you complete the remaining steps.	• System values selection • Application description
Set up user groups	Create job descriptions, group libraries, and group profiles.	User group description
Create profiles for users in the group	Create individual user profiles	"User profile worksheet" on page 41
Create a personal library for each member of the group	Create individual libraries	Library description

Related concepts

User security
From a user's point of view, security affects how they use and complete tasks on the system.

Installing application libraries

This topic covers the security steps necessary to load your application libraries to your system.

You should load application libraries to the system before setting up user groups and individual profiles. You need to refer to application objects when you create job descriptions and application owner profiles. If you are not able to load your applications before creating group and individual profiles, you may receive warning messages:

• The system does not find initial libraries when you create job descriptions.

• The system does not find the initial program or menu when you create profiles.

You cannot successfully test job descriptions and profiles until you load your application libraries.

To load each of your applications, complete these tasks:

Creating an owner profile

This topic describes the steps for creating an owner profile, which is required before you can set up user groups.

Before you can create owner profiles for your applications, you need to sign on to the system. Check with your application provider to see if you should be signed on as the security officer or the application owner when you load the application libraries. After you sign on, you can create an owner profile for your applications.

Check your Application description to see if you need to create any profiles before you load the application. To create a profile:

1. Type CRTUSRPRF (Create User Profile) and press F4 (Prompt).
2. On the Create User Profile display, fill in the fields as instructed by your programmer or application provider.
3. Use F10 (More fields) and page down to display additional fields.
4. Check the bottom of your display for messages.

```
          Create User Profile (CRTUSRPRF)
Type choices, press Enter.

User profile   . . . . . . . . .
User password  . . . . . . . . .   *USRPRF
Set password to expired  . . . .   *NO
Status . . . . . . . . . . . . .   *ENABLED
User class . . . . . . . . . . .   *USER
Assistance level . . . . . . . .   *SYSVAL
Current library  . . . . . . . .   *CRTDFT
Initial program to call  . . . .   *NONE
  Library  . . . . . . . . . .
Initial menu   . . . . . . . . .   MAIN
  Library  . . . . . . . . . .      *LIBL
Limit capabilities   . . . . . .   *NO
Text 'description'   . . . . . .   Owner of xxxxxx
```

Related concepts

Creating a group profile

When you create a job description, you also need to a create group profile to define object authority for a group of users. Group profiles are a more efficient way to handle object authority than by giving authority to each user individually.

Loading applications

After you create owner profiles for your applications, you can use Application Administration to load applications.

Application Administration is available on IBM Navigator for i, the graphical interface for the system. Application Administration allows system administrators to control the functions or applications available to users and groups on a specific server. This includes controlling the functions available to users that access their server through clients. It is important to note here, that if you access the server from a Windows client, the server user and not the Windows user determines which functions are available for administration.

Related information

Application administration

Setting up user groups

After you have loaded your applications you need to complete these tasks to set up user groups.

In this task, you will create group libraries, job descriptions, and group profiles. Work through the entire topic with one of your user groups, then go back and repeat the steps for any additional groups. You will need the User Group Description forms that you prepared in .

Creating a library for a group

The first step in setting up a user group is to create a library for the user group. You can use libraries to store objects such as programs.

Before you set up user groups, sign on to the system using your own profile, *SECADM authority is required. Go to the MAIN menu.

After you sign on to the system, you need to create a library for the user group. If you plan to have the group share a library for objects they create, such as Query programs, create the library before you create the group profile:

1. Type CRTLIB (Create Library) and press F4 (Prompt).
2. Fill in the display. The library name should be the group profile name.
3. Press F10 (Additional parameters).
4. Fill in the public authority for the library and new objects that are created in the library.
5. Press the Enter key. Check the confirmation message.

```
                Create Library
Type choices, press Enter.
Library  . . . . . . . . . . . . DPTWH
Library type . . . . . . . . . . *PROD
Text 'Description' . . . . . . . Warehouse Library

Additional Parameters
Authority  . . . . . . . . . . . *USE
Auxiliary storage pool ID  . . . 1
Create authority . . . . . . . . *CHANGE
Create object auditing . . . . . *SYSVAL
```

Possible error	Recovery
You pressed the Enter key before you typed a description for the library.	Type CHGLIB and press F4 (Prompt). Type the library name on the prompt display and press the Enter key. Type the description on the Change Library display.
You gave the library the wrong name.	Use the Rename Object (RNMOBJ) command.

Creating a job description for a group

Once you have created a library for your user group, you need to create a job description for the group. A job description contains a specific set of job-related attributes, such as which job queue to use, scheduling priority, routing data, message queue severity, library list and output information.

The attributes in your job descriptions determine how each job is run on the system. If the libraries needed for the initial library list are not yet on the system, you receive a warning message when you create the job description.

1. Type CRTJOBD (Create Job Description) and press F4 (prompt).
2. Fill in these fields:

   Job description:
   Same as group profile name.

   Library name:
   QGPL Text: Group description

3. Press F10 (Additional parameters).
4. Page down to the Initial Library List field.

```
        Create Job Description

Type choices, press Enter.

Job description . . . . . . . . . DPTSM
  Library . . . . . . . . . . . . QGPL
Job queue . . . . . . . . . . . . QBATCH
  Library . . . . . . . . . . . . *LIBL
Job priority (on JOBQ). . . . . . 5
Output priority (on OUTQ) . . . . 5
Print device  . . . . . . . . . . *USRPRF
Output queue  . . . . . . . . . . *USRPRF
  Library . . . . . . . . . . . .
Text 'description'. . . . . . . . Sales and Marketing
```

5. Type a + (plus) over *SYSVAL in the Initial library list field to specify that you want to enter a list of values. Press the Enter key.

```
Accounting code . . . . . . . . . .   *USRPRF
   .
   .
CL syntax check . . . . . . . . . .   *NOCHK
Initial library list  . . . . . . .   +
           + for more values
```

6. In the Initial Library List field, type the names of libraries that are checked off in your user group description worksheet:

   • Put one library name per line.

   • Include QGPL and QTEMP. Every job uses a library called QTEMP to store temporary objects. **All initial library lists must have the QTEMP library.** For most applications, the QGPL library should also be on the initial library list.

   • You do not need to include the current (default) library on the library list. The system adds that library automatically at signon.

7. Press the Enter key. Check messages. Page down to see all messages.

```
Specify More Values for

Type choices, press Enter.

Initial library list . . . . . .   CUSTLIB
                                    ITEMLIB
                                    COPGMLIB
                                    ICPGMLIB
                                    QGPL
                                    QTEMP
```

Possible error	Recovery
You pressed the Enter key instead of F10.	To put the correct libraries in the initial library list, type CHGJOBD (Change Job Description) and press F4.
You get error messages when you try to create the job description.	The most common error message occurs when you try to include a library that is not on the system. This message is a warning. The job description is still created with the library in the initial library list. You cannot sign on with a profile that specifies the job description until the library is on the system.
	If the library is on the system, you might have typed the name incorrectly. Verify the library name and try again.

Related information

Job description

Creating a group profile

When you create a job description, you also need to a create group profile to define object authority for a group of users. Group profiles are a more efficient way to handle object authority than by giving authority to each user individually.

After you create a job description, you can create the group profile using the information from Part 2 of the User Group Description form.

1. Use the Work with User Profiles command. Type WRKUSRPRF *ALL. Initially, the display lists the profiles supplied by IBM.

   Note: If you see the Work with User Enrollment display, press F21 to change to intermediate assistance level.

2. To create a new profile, type 1 in the option (*Opt*) column and profile name in the User Profile column. Press the Enter key.

```
          Work with User Profiles

Type options, press Enter.
  1=Create  2=Change  3=Copy  4=Delete  5=Display
  12=Work with objects by owner

      User
Opt   Profile  Text
1     DPTSM
      QDOC     Document User Profile
      QSECOFR  Security Officer User Profile
```

3. Type information from your User Group Description form into the appropriate fields.

4. Use the Tab key to skip over any fields where you want to use the default value.

5. Press F10 (Additional parameters).

6. Page down.

```
            Create User Profile (CRTUSRPRF)

Type choices, press Enter.

User profile  . . . . . . . . .  DPTSM
User password . . . . . . . . .  *NONE
Set password to expired . . . .  *NO
Status  . . . . . . . . . . . .  *ENABLED
User class  . . . . . . . . . .  *USER
Assistance level  . . . . . . .  *SYSVAL
Current library . . . . . . . .  *CRTDFT
Initial program to call . . . .  cpsetup
Library   . . . . . . . . . . .  cppgmlib
Initial menu  . . . . . . . . .  cpmain
Library . . . . . . . . . . . .  cppgmlib
Limit capabilities  . . . . . .  *yes
Text 'description'. . . . . . .  Sales and Marketing
```

7. Enter the remaining fields from your User Group Description form on the additional pages of the display and press the Enter key.

```
            Create User Profile

            Additional Parameters

Special authority . . . . . . .  *USRCLS
.
.
Job description . . . . . . . .  DPTSM
   Library . . . . . . . . . . .  QGPL
```

8. Check messages.

```
            Create User Profile

Group authority . . . . . . . .  *NONE
.
.
Print device  . . . . . . . . .  PRT03
```

Important: A group profile is just a special type of user profile. Many messages and displays refer to group profiles as users or user profiles. The system only knows that you have created a group profile if you add members to it or assign a group identification number (gid) to it.

Possible error	Recovery
You pressed the Enter key before typing all the values in the group profile.	Press F5 (Refresh) to add the profile that you created to the Work with User Profiles display. Use Change Option (2) to correct the profile.
You created a profile with the wrong name.	You cannot change the name of a profile. Use the Copy Option (3) to create a new profile with the correct name. Then Delete Option (4) the profile with the wrong name.
Some of the fields from the User Group Description form do not appear on the display.	Make sure you are using intermediate assistance level. The basic assistance level version of Create User Profile is called the Add a User display. To change assistance levels, press F12 (Cancel) to return to the Work with User Enrollment display. Use F21 to change assistance levels.
You accidentally erased some of the default information from the Create User Profile display.	If you leave a field blank, the system uses the default value when the user profile is created. If you want to see the default values, press F5 (Refresh) to restore the entire display. Type your information again.

Listing your results

List the names and descriptions of all profiles on the system by using the Display Authorized Users (DSPAUTUSR) command. Type DSPAUTUSR OUTPUT(*PRINT). Check to make sure that all group profiles have a password of *NONE.

Complete the following before you set up individual users:

- Create a job description for each user group.
- Optionally, create a library for each group.
- Create a group profile for each user group.

Related concepts

Group profiles
A *group profile* is a special type of user profile that provides the same authority to a group of users.

Creating an owner profile
This topic describes the steps for creating an owner profile, which is required before you can set up user groups.

Related information

Planning group profiles
IBM-supplied user profiles

Creating profiles for users in the group
This topic describes how to create profiles for individual users.

When you set up user groups, you completed the steps to create group profiles. Now, you create individual profiles for the members of the groups. Work through the entire topic with the members of one user group, then go back and repeat the steps for any additional groups.

Use the Individual User Profile worksheet that you prepared in "Planning user profiles" on page 40.

To create individual profiles for the members of the groups, complete these tasks:

1. Create a personal library (optional).
2. Copy the group profile.
3. Set the password to expire.
4. Create additional users (optional).
5. Change information about a user, if necessary.
6. Display your results.

Note: Repeat creating a personal library and creating additional users, until every group member has a user profile.

Related concepts

Planning user profiles

A user profile contains security-related information that controls how the user signs on the system, what the user is allowed to do after signing on, and how the user's actions are audited.

Related information

Job description

Creating a personal library for each member of a group

This topic describes how to create a personal library for each member of the group, explains why it is important, and provides step-by-step instructions.

To begin setting up individual users, you may need to create a personal library for each member for objects, such as Query programs. Create personal libraries before you create the individual user profiles.

1. Type CRTLIB and press F4 (Prompt).

2. Give the library the same name as the user profile.

3. Press F10 (Additional parameters).

4. Fill in the public authority for the library and new objects that are created in the library.

5. Press the Enter key. Check the confirmation message.

```
             Create Library

Type choices, press Enter.

Library  . . . . . . . . . . . . DPTSM
Library type . . . . . . . . . . *PROD
Text 'description' . . . . . . . Warehouse Library

             Additional Parameters

Authority  . . . . . . . . . . . *EXCLUDE
Auxiliary storage pool ID  . . . 1
Create authority . . . . . . . . *CHANGE
Create object auditing . . . . . *SYSVAL
```

After you create a personal library, you can create the individual profile by copying the group profile.

Related information

Security risks of library lists

Planning libraries

Copying the group profile

The first group profile you create can also be used as a pattern for other group profiles.

The group profile has two roles:

1. The system uses it to determine whether a group member is authorized to use an object.

2. You can use it as a pattern to create user profiles for the individual group members.

When you set up user groups, you created group profiles. Now, you can copy a group profile to create an individual profile and copy the individual profile to create other profiles in the group.

1. Select the Work with User Enrollment option from the SETUP menu.

   Tip: If you see the Work with User Profiles display, use F21 (Select assistance level) to change to basic assistance level.

2. Type 3 (Copy) in the *Opt* column in front of the user group. The screen shows the Copy User display. If the user group you want to copy is not on your display, page down until you find it. The system leaves the user name field blank and fills in the remaining fields from the group profile that you copied.

```
            Work with User Enrollment

Type options below, then press Enter.
  1=Add  2=Change  3=Copy  4=Remove  5=Display

Opt   User     Description
      DPTSM    Sales and Marketing Department
3     DPTWH    Warehouse Department
```

3. Type the name and description of the user profile that you are creating.

4. Leave the password blank. The system automatically makes the password the same as the new user profile name.

5. Put the group profile name in the User Group field.

6. Check your Individual User Profile worksheet to see if this user has other values that are different from the group. Enter those values.

7. Page down.

```
            Copy User

Copy from user . . . . :   DPTWH

Type choices below, then press Enter.

User . . . . . . . . . . WILLISR
User description . . . . Willis, Rose
Password . . . . . . . .
Type of user . . . . . . *SYSOPR
User group . . . . . . . DPTWH

Restrict command line use N

Default library  . . . . DPTWH
Default printer  . . . . PRT04
Sign on program  . . . . *NONE
Library  . . . . . . . .
First menu . . . . . . . ICMAIN
  Library  . . . . . . . ICPGMLIB
```

8. Make any changes that are necessary on the next page of the display and press the Enter key.

9. Check for confirmation messages at the bottom of the Work with User Enrollment display.

```
            Copy User

Copy from user . . . . :   DPTWH

Type choices below, then press Enter.

Attention key program  . *SYSVAL
  Library . . . . .
```

Possible error	Recovery
You see the Create User Profile display instead of the Copy User display.	Use F12 (Cancel) to return to the Work with User Profiles display. Use F21 to change to basic assistance level. Start the copy operation again.
The user profile name that you have selected will not fit in the user prompt.	Although user profile names may be up to 10 characters, the Copy User and Add User displays support no more than 8 character names. Either choose a shorter user name or use the intermediate assistance level to create individual user profiles.

Testing the user profile

When you create the first individual profile in a group, you should test it by signing on with that profile. Verify that you see the correct first menu and that the signon program runs.

If you are unable to sign on successfully with the profile, the system probably cannot find something specified in the profile. This might be the sign-on program, the job description, or one of the libraries in the initial library list. Use the Work with Printer Output display to find the job log that was written when you tried to sign on. The job log tells you what errors occurred.

After you test the user profile, set the password to expire.

Using an individual profile as a group profile

Creating profiles specifically to be group profiles is preferable to making existing profiles into group profiles. You may find that a specific user has all the authorities needed by a group of users and be tempted to make that user profile into a group profile. However, using an individual's profile as a group profile may cause problems in the future:

- If the user whose profile is used as the group profile changes responsibilities, a new profile needs to be designated as the group profile, authorities need to be changed, and object ownership needs to be transferred.
- All members of the group automatically have authority to any objects created by the group profile. The user whose profile is the group profile loses the ability to have private objects, unless that user specifically excludes other users.

Try to plan group profiles in advance. Create specific group profiles with password *NONE. If you discover after an application has been running that a user has authorities that should belong to a group of users, do the following tasks:

1. Create a group profile.
2. Use the **GRTUSRAUT** command to give the user's authorities to the group profile.
3. Remove the private authorities from the user, because they are no longer needed. Use the **RVKOBJAUT** or **EDTOBJAUT** command.

Setting the group profile password to expire
This topic describes how to set the group profile password to expire, explains why it is important, and provides step-by-step instructions.

Set up individual profiles to require that users change their passwords the first time they sign on. The Set Password to Expire field does not appear on the basic assistance level version of the Copy User display. You need to change it separately, after you create the user profile with the copy function. To change the Set Password to Expire field, type CHGUSRPRF profile-name PWDEXP(*YES).

Note: If you want to test a user profile by signing on with it, do the test before you set the password to expire.

Possible Error	Recovery
You tested a profile and were forced to change the password.	Type CHGUSRPRF *profile-name* and press F4 (Prompt). Set the password back to the user profile name. (Type the user profile name in the password field.) Type *YES in the Set Password to Expire field. You need intermediate assistance level to do this.

Related information
Set password to expired

Creating profiles for users not in a group

Copy the first individual user profile to create additional members in the group. Look at each individual profile carefully when you create it with the copy method.

Check your Individual User Profile form and make sure that you change any fields that are unique for the new user profile.

1. Use the Work with User Profiles command. Type WRKUSRPRF *ALL.

    Note: If you see the Work with User Profiles display, press F21 to change to basic assistance level.

2. On the Work with User Enrollment display, type 3 (Copy) in front of the user profile you want to copy.

3. On the Copy User display, type the profile name and description.

4. Enter information into any fields that are unique for the new user.

```
            Work with User Enrollment

Type options below, then press Enter.
  1=Add  2=Change  3=Copy  4=Remove  5=Display

Opt   User    Description
      DPTSM   Sales and Marketing Department
      DPTWH   Warehouse Department
3     WILLISR Willis, Rose
```

Possible Error	Recovery
The profile that you want to copy does not appear on the Work with User Enrollment display.	Press F5 (Refresh). Page up and page down. The list is alphabetical by profile name.

Changing information about a user

For some users, you may need to set values that do not appear on the Copy User display. For example, some users may belong to more than one group profile. After you have created a user profile by using the copy method, you can change it.

1. On the Work with User Enrollment display, press F21 to change to intermediate assistance level.

2. On the Work with User Profiles display, type a 2 (Change) in the *Opt* (option) column next to the profile you want to change. Press the Enter key.

```
            Work with User Profiles

Type options, press Enter.
  1=Create  2=Change   3=Copy 4=Delete  5=Display
  12=Work with objects by owner

      User
Opt   Profile  Text
2     AMESJ    Ames, Janice
      DPTSM    Sales and Marketing Department
      QDOC     Document User Profile
      QSECOFR  Security Officer User Profile
      WAGNERR  Wagner, Ray
      WILLISR  Willis, Rose
```

3. On the Change User Profile display, press F10 (Additional parameters).

4. Page down until you find the fields that you want to change. For example, if you want to make the user a member of additional group profiles, page down until you find the Supplemental Groups field.

5. Type the values you want and press the Enter key. You receive confirmation messages and see the Work with User Profiles display again.

```
              Change User Profile (CHGUSRPRF)

Type choices, press Enter.

Maximum allowed storage . . . .  *NOMAX
Highest schedule priority . . .  3
Job description . . . . . . . .  DPTWH
Library . . . . . . . . . . .    QGPL
Group profile . . . . . . . .    DPTWH
Owner . . . . . . . . . . . .    *GRPPRF
Group authority . . . . . . .    *USEE
Group authority type  . . . . .  *PGP
Supplemental groups . . . . .    DPTIC
         + for more values
```

Displaying user profiles

Several methods are available to display the profiles that you have created or changed.

Displaying one profile:
Use option 5 (Display) from either the Work with User Enrollment display or the Work with User Profiles display.

Listing one profile:
Use the Display User Profile command: DSPUSRPRF *profile-name* DETAIL(*BASIC) OUTPUT(*PRINT).

Displaying group members:
Type DSPUSRPRF *group-profile-name* *GRPMBR. You can use OUTPUT(*PRINT) to print the list.

Listing all profiles:
To list the names and descriptions of all profiles, sorted by group, use the Display Authorized Users command: DSPAUTUSR SEQ(*GRPPRF) OUTPUT(*PRINT).

Before you set up ownership and public authority, complete these tasks:

- Finish creating all your individual user profiles.

- Set the password to expire for each profile.

- Print a list of all profiles sorted by group and keep it with your User Group Description forms. Print the list again when you add new users.

Related concepts

Planning user profiles
A user profile contains security-related information that controls how the user signs on the system, what the user is allowed to do after signing on, and how the user's actions are audited.

Limiting access to program functions

The limit access to program function allows you to define who can use an application, the parts of an application, or the functions within a program.

The limit access to program function allows you to provide security for a program when you do not have an object to secure for the program. There are two methods that you can use to manage user access to application functions through IBM Navigator for i.

Using Application Administration to manage user access

To manage user access using Application Administration, follow these steps:

1. Expand **System**.

2. Click **Application Administration**.

3. If you are on an administration system, select **Local Settings**. Otherwise, continue with the next step.

4. Select an administrable function.

5. Select **Default Access** to allow all users to access the function by default.

6. Select **All Object Access** to allow all users with all object system privilege to access this function.

7. Select **Customize**and use the **Add** and **Remove** buttons on the **Customize Access** dialog box to add or remove users or groups in the **Access Allowed** and **Access Denied** lists.

8. Select **Remove Customization** to delete any customized access for the selected function.

9. Click **OK** to close the **Application Administration** dialog box.

Using Users and Groups to manage user access

To manage user access using Users and Groups, follow these steps:

1. Click **Users and Groups** to show the Users and Groups welcome panel.

2. Select **Users**, **Groups**, or **Users Not in a Group** to display a list of users and groups.

3. Right-click a user or group, and select **Application Administration**.

4. On Applications tab, you can change the access setting for a user or group.

5. Click **OK** to close the **Properties** sheet.

Important: The limit access to program function does not prevent a user from accessing a resource, such as a file or program, from another interface. You still need to use resource security.

The limit access to program function support provides APIs to:

- Register a function
- Retrieve information about the function
- Define who can or cannot use the function
- Check to see if the user is allowed to use the function

To use this function within an application, the application provider must register the functions when the application is installed. The registered function corresponds to a code block for specific functions in the application. When the user runs the application, the application calls the check usage API to see if the user is allowed to use the function that is associated with the code block, before invoking the code block. If the user is allowed to use the registered function, the code block is run. If the user is not allowed to use the function, the user is prevented from running the code block.

The system administrator specifies who is allowed or denied access to a function. The administrator can either use the Work with Function Usage Information (WRKFCNUSG) command to manage the access to program function or use IBM Navigator for i.

Implementing resource security

This information helps you establish resource security for workstations and printers by setting ownership and public authority to objects, as well as specific authority to applications.

Your most important protection is resource security on your server. Resource security on the system allows you to define who can use objects and how those objects can be used. The ability to access an object is called authority. When you set up object authority, you can need to be careful to give your users enough authority to do their work without giving them the authority to browse and change the system. Object authority gives permissions to the user for a specific object and can specify what the user is allowed to do with the object. An object resource can be limited through specific detailed user authorities, such as adding records or changing records.

System resources can be used to give the user access to specific system-defined subsets of authorities: *ALL, *CHANGE, *USE, and *EXCLUDE. Files, programs, libraries, and directories are the most common system objects that require resource security protection, but you can specify authority for any individual object on the system.

You will need the following worksheets during this process:

- The Application description worksheet

- The Authorization list worksheet
- The Library description worksheet
- The Output queue and workstation security worksheet
- The System responsibilities worksheet

Related concepts

Resource security
You can use resource security on the system to control the actions of authorized users after successful authentication.

Related reference

Application description worksheet
Complete an Application description worksheet for each application on your system.

Authorization lists worksheet
Use this worksheet to create an Authorization list for an application on your system.

Library description worksheet
After you have described your naming conventions, you should describe the libraries on your system. Libraries identify and organize objects on your system.

Printer output queue security worksheet
Complete this worksheet as part of your printer output queue security.

System responsibilities worksheet
You will complete the system responsibilities worksheet by naming your security officers.

Setting up ownership and public authority

Part of implementing your security plan is establishing the ownership and public authority for application libraries, group libraries, and personal libraries.

You need to work through this process with one application, and then go back and repeat the steps for any additional applications. The sample displays show the Application Installation forms that Sharon Jones prepared for the Customer Orders application in "Planning your application installation."

Use the procedures in this topic whenever you install a new application on your system or when you set up security for an existing application. Use the Application Installation forms that you prepared in "Planning your application installation."

In order to set up ownership and public authority, complete these tasks:

1. Create the owner profile
2. Change library ownership
3. Set ownership of application objects
4. Set public access to a library
5. Set public authority for all objects in a library
6. Set public authority for new objects
7. Work with group and personal libraries

Sign on to the system.

Profile
    Your own (*ALLOBJ authority is required)

Menu
    MAIN

Creating an owner profile

This topic outlines the process of creating an owner profile.

If the owner profile does not yet exist, use the Create User Profile (**CRTUSRPRF**) command to create it. Set the password to *NONE.

If the owner profile already exists, use the Change User Profile (**CHGUSRPRF**) command to set the password to *NONE.

Changing library ownership

There will be times when only the ownership of a library changes, not the objects in the library. Once an owner profile is created, you can change the ownership of a library to the new profile.

Attention: Be sure to check with your application provider before you change ownership of any application objects. Some applications use functions that rely on specific object ownership.

1. Type CHGOBJOWN (Change Object Owner) and press F4 (Prompt).
2. Fill in the library name, object type (*LIB), and new owner.
3. Check confirmation messages.

After you change library ownership, you can set ownership for application objects.

Setting up ownership of application objects

Changing the ownership of application objects is a cumbersome task, because you must change each object individually. If possible, ask your programmer or application provider to establish ownership for you.

Listing the objects in a library

Before you change ownership, print a list of all the objects in the library, using the Display Library command. You can use it as a checklist. Type DSPLIB library-name *PRINT.

Choosing the best method

Choose one of these two methods to change ownership of objects in your application libraries:

Method	What it does	When to use it
The Works with Objects by Owner command	Shows a display which lists all the objects that a profile owns. You use an option on the display to change the owner of an object.	This method is easier to use. However, if either QPGMR or QSECOFR own the objects, IBM does not recommend this method. Those profiles own many objects, and your list display is very large.
The Change Object Ownership command	Requires using a separate command for each object. However, you can use Retrieve (F9) to repeat the previous command and reduce the amount of typing required.	This method is faster if either QPGMR or QSECOFR own the objects.

Setting up public access to a library

After you set ownership of application objects, you can use the Edit Object Authority (EDTOBJAUT) command to change public authority to the library:

These steps will set up public access to a library on your system.

1. Type EDTOBJAUT library-name *LIB.
2. Move the cursor down to the line showing *PUBLIC.

3. Type the authority which you want the public to have to the library and press the Enter key. The display shows the new authority.

Setting up public authority for objects in a library

Use the Grant Object Authority (**GRTOBJAUT**) command to set public authority for all the objects in a library.

Note: Use the Revoke Object Authority (**RVKOBJAUT**) command to remove the current public authority for objects in a library.

1. Type RVKOBJAUT and press F4 (Prompt).
2. Fill in the display as shown, substituting the name of your application library, and press the Enter key.

   Note: If the library has a large number of objects, the system may take a few minutes to process your request.
3. Type GRTOBJAUT and press F4 (Prompt).
4. Fill in the display as shown, substituting the name of your application library and the authority you want, and press the Enter key.

   Note: If the library has a large number of objects, the system may take a few minutes to process your request.

After you have completed setting public authority for all objects in a library, you can use the job log to check your work next.

Setting up public authority for new objects

The library description has a parameter called create authority (CRTAUT), which determines the public authority for new objects that are created in the library. The commands that create objects use the CRTAUT authority of the object library as the default. You should make the CRTAUT for a library the same as the public authority for the majority of existing objects in the library.

1. Type CHGLIB library-name and press F4 (Prompt).
2. Press F10 (Additional parameters).
3. Enter your choice in the Create authority field.

If you set the CRTAUT to *SYSVAL, the system uses the current setting for the QCRTAUT system value when you create a new object in the library. Setting a specific CRTAUT authority for each library protects against future changes to the QCRTAUT system value.

Working with group and personal libraries

Your profile owns the group and personal libraries you created when you set up user groups and individual users.

Use the procedures just covered to change ownership of group libraries to the group profile and change ownership of personal libraries to the individual user profiles.

Set the Create Authority parameter for each group and personal library to determine the public authority for any new objects in those libraries.

Before you start creating authorization lists, complete these tasks:

1. Use your Application Installation forms and your Library Description forms to make sure that you have established ownership and public authority for all your application libraries.
2. Set ownership and create authority for all of the group and personal libraries that you created.

Note: You can get a list of all the libraries on your system by typing DSPOBJD *ALL *LIB *PRINT.

Setting up specific authority for objects and libraries

You can use the Edit Object Authority (EDTOBJAUT) command to set specific authority for the library and objects in the library.

In Setting up ownership and public authority, you learned how to use the GRTOBJAUT command to set public authority for all the objects in a library, based on the information on your Library description form. Now you will use EDTOBJAUT, and the information on your Library description form to set specific object and library authorities.

Related concepts

System-defined authorities
Your system was shipped with several system-defined authorities: *USE, *CHANGE, *ALL, and *EXCLUDE. These authorities apply to securing files, programs, and libraries.

Setting up authority for a library

A library is really a special type of object. You set authority for a library just like you set authority for any other object, by using the EDTOBJAUT command. All libraries reside in the IBM-supplied library that is called QSYS.

Use the Edit Object Authority (**EDTOBJAUT**) command to set specific authority for the library and objects in the library, based on the information on your Library description worksheet.

1. Type EDTOBJAUT and press F4 (Prompt).
2. Fill in the prompt display and press the Enter key.
3. On the Edit Object Authority display, press F6 (Add new users) to give authority to users whom the display does not list.
4. Press the Enter key.
5. The Edit Object Authority display should match the information on both Parts 1 and 2 of the Library Description form.

The public authority for new objects (CRTAUT) authority does not appear on the Edit Object Authority display for a library. Use the Display Library (**DSPLIB**) command to see the CRTAUT for a library. You can also use this procedure to set up specific authority to an object on the system. You can now set specific authority for an object.

Setting up authority for an object

The procedure for setting specific authority for an object in an application library is the same as setting specific authority for a library.

1. Type EDTOBJAUT and press F4 (Prompt).
2. Fill in the information on the prompt display and press the Enter key.
3. Fill in the authority information on the Edit Object Authority display and press the Enter key.

Setting up authority for multiple objects

Use the Grant Authority (GRTOBJAUT) command to set security for multiple objects.

Type GRTOBJAUT and press F4 (Prompt).

Note: Many commands allow you to specify the first characters followed by an asterisk (*) for a parameter. The system performs the operation on every object whose name starts with those characters.

Use the DSPJOBLOG command to check your work to verify that the system made the requested authority changes.

Before going to Securing printer output, use the EDTOBJAUT or the GRTOBJAUT command to set up the specific authorities on your Library Description form.

Enforcing object authority

Whenever you try to access an object, the operating system checks your authority to that object.

If the security level on your system (QSECURITY system value) is set to 10 or 20, every user automatically has authority to access every object because every user profile has *ALLOBJ special authority.

Object authority tip: If you are not sure whether you are using object security, check the QSECURITY (security level) system value. If QSECURITY is 10 or 20, you are not using object security.

You must plan and prepare before you change to security level 30 or higher. Otherwise, your users may not be able to access the information that they need.

Setting up menu security

There are several user profile parameters used for setting up menu security.

The server provides several user profile parameters that you can use to carry out menu access control:

- Use **Initial menu** (INLMNU) parameter to control what menu the user first sees after the user signs on.
- Use **Initial program** (INLPGM) parameter to run a setup program before the user sees a menu, or you can use this parameter to restrict a user to running a single program.
- Use **Limit capabilities** (LMTCPB) parameter to restrict a user to a limited set of commands. This parameter also prevents the user from specifying a different initial program or menu on the Sign On display. The LMTCPB parameter only limits commands that are entered from the command line.

Related concepts

Menu security
Menu security controls which menu functions a user can perform.

Related information

Initial menu
Initial program
Limit capabilities

Limitations of menu access control

You cannot rely solely on menu access control to protect your system and allow users to use the system effectively to do their jobs.

There are a number of limitations to menu access control. Computers and users have changed a great deal in the past few years. Many tools, such as query programs and spreadsheets, are available so that users can do some of their own programming, which lightens the work load of IS departments. Some tools, such as SQL or ODBC, provide the capability to view information and to change information. To enable these tools within a menu structure is very difficult.

As a security administrator who is trying to enforce menu access control, you have two basic problems:

- If you are successful in limiting users to menus, your users will probably be unhappy because their ability to use modern tools is limited.
- If you are not successful, you can jeopardize critical confidential information that menu access control is supposed to protect. When your system participates in a network, your ability to enforce menu access control decreases. For example, the LMTCPB parameter applies only to commands that are entered from a command line in an interactive session. The LMTCPB parameter has no affect on requests from communications sessions, such as PC file transfer, FTP, or remote commands.

Enhancing menu access control with object security

Controlling your object security along with good menu access control creates a more effective security plan.

With the many options that are available to connect to systems, a viable server security scheme for the future cannot rely solely on menu access control. You can enhance menu access control by granting appropriate authority that users must have to objects to run their applications. You then assign users

to groups and give the groups appropriate authority. This approach is reasonable and logical. However, if your system has been operational for many years and has many applications, the task of analyzing applications and setting up object authority probably seems overwhelming.

The solution to this problem can be to use your current menus to set up a transition environment while you gradually analyze your applications and objects.

Tip: Your current menus combined with programs that adopt the authority of the program owners may provide a transition beyond menu access control. Be sure to protect both the programs that adopt authority and the user profiles that own them.

Example: Changing the menu control environment
In this example, you are changing the menu control environment for the Order Entry (OEMENU) menu and the associated files and programs.

This example starts with the following assumptions and requirements:

- All of the files are in the library ORDERLIB.
- You do not know the names of all the files. You also do not know what authority the menu options require to different files.
- The menu and all the programs that it calls are in a library called ORDERPGM.
- You want everyone who can sign on to your system to be able to view information in all the order files, customer files, and item files (with queries or spreadsheets, for example).
- Only users whose current signon menu is the OEMENU should be able to change the files. They must use the programs on the menu to do this.
- System users other than the security administrators do not have *ALLOBJ or *SECADM special authority.

Perform the following steps to change this menu access control environment to accommodate the need for queries:

1. Make a list of the users whose initial menu is the OEMENU. You can use the Print User Profile (PRTUSRPRF *ENVINFO) command to list the environment for every user profile on your system. The report includes the initial menu, initial program, and current library.
2. Make sure that the OEMENU object (it may be a *PGM object or a *MENU object) is owned by a user profile that is not used for sign-on. The user profile should be disabled or have a password of *NONE. For this example, assume that OEOWNER owns the OEMENU program object.
3. Make sure that the user profile that owns the OEMENU program object is not a group profile. You can use the following command:

   ```
   DSPUSRPRF USRPRF(OEOWNER) TYPE(*GRPMBR)
   ```
4. Change the OEMENU program to adopt the authority of the OEOWNER user profile. Use the CHGPGM command to change the USRPRF parameter to *OWNER.

   *MENU objects cannot adopt authority. If OEMENU is a *MENU object, you can adapt this example by doing one of the following actions:

   - Create a program to display the menu.
   - Use adopted authority for the programs that run when the user selects options from the OEMENU menu.
5. Set the public authority to all of the files in ORDERLIB to *USE by typing the following two commands:

   ```
   RVKOBJAUT OBJ(ORDERLIB/*ALL)OBJTYPE(*FILE) USER(*PUBLIC) AUT(*ALL)
   GRTOBJAUT OBJ(ORDERLIB/*ALL)OBJTYPE(*FILE) USER(*PUBLIC) AUT(*USE)
   ```

   Remember that if you select *USE authority, users can copy the file by using PC file transfer or FTP.
6. Give the profile that owns the menu program *ALL authority to the files by typing the following command:

   ```
   GRTOBJAUT OBJ(ORDERLIB/*ALL)OBJTYPE(*FILE) USER(OEOWNER) AUT(*ALL)
   ```

For most applications, *CHANGE authority to files is sufficient. However, your applications may perform functions, such as clearing physical file members, that require more authority than *CHANGE. Eventually, you should analyze your applications and provide only the minimum authority that is necessary for the application. However, during the transition period, by adopting *ALL authority, you avoid application failures that may be caused by insufficient authority.

7. Restrict authority to the programs in the order library by typing:

```
GRTOBJAUT OBJ(ORDERPGM/*ALL) OBJTYPE(*PGM) USER(*PUBLIC) AUT(*EXCLUDE)
```

8. Give the OEOWNER profile authority to the programs in the library by typing:

```
GRTOBJAUT OBJ(ORDERPGM/*ALL) OBJTYPE(*PGM) USER(OEOWNER)AUT(*USE)
```

9. Give the users that you identified in step 1 authority to the menu program by typing the following for each user:

```
GRTOBJAUT OBJ(ORDERPGM/OEMENU) OBJTYPE(*PGM) USER(user-profile-name) AUT(*USE)
```

When you have completed these steps, all system users who are not explicitly excluded will be able to access, but not change the files in the ORDERLIB library. Users who have authority to the OEMENU program will be able to use the programs that are on the menu to update files in the ORDERLIB library. Only users who have authority to the OEMENU program will now be able to change the files in this library. A combination of object security and menu access control protects the files.

When you complete similar steps for all the libraries that contain user data, you have created a simple scheme for controlling database updates. Menu control prevents system users from updating database files except when they use the approved menus and programs. At the same time, you have made database files available for viewing, analyzing, and copying by users with decision support tools or with links from another system or from a PC.

Tip: When your system participates in a network, *USE authority may provide more authority than you expect. For example, with FTP, you can make a copy of a file to another system, including a PC if you have *USE authority to the file.

Using library security to complement menu security
You need to set library authority for users of a particular menu.

To access an object in a library, you must have authority both to the object and to the library. Most operations require either *EXECUTE authority or *USE authority to the library.

Depending on your situation, you may be able to use library authority as a simple means for securing objects. For example, assume that for the Order Entry menu example, everyone who has authority to the Order Entry menu can use all of the programs in the ORDERPGM library. Rather than securing individual programs, you can set the public authority to the ORDERPGM library to *EXCLUDE. You can then grant *USE authority to the library to specific user profiles, which will allow them to use the programs in the library. This assumes that public authority to the programs is *USE or greater.

Library authority can be a simple, efficient method for administering object authority. However, you must ensure that you are familiar with the contents of the libraries that you are securing so that you do not provide unintended access to objects.

Securing the integrated file system

The integrated file system provides you with multiple ways to store and view information on the system. Your security plan needs to include how users will be allowed to access and manipulate files on the system.

The integrated file system is a part of the IBM i operating system that supports stream input and output operations. It provides storage management methods that are similar to, and compatible with, personal computer operating systems and UNIX operating systems.

With the integrated file system, all objects on the system can be viewed from the perspective of a hierarchical directory structure. However, in most cases, users view objects in the way that is most common for a particular file system. For example, standard system objects are in the QSYS.LIB file

system. Typically, users view these objects from the perspective of libraries. Users typically view objects in the QDLS file system from the perspective of documents within folders. The root (/), QOpenSys, and user-defined file systems present a structure of hierarchical directories.

As a security administrator, you need to understand:

- Which file systems are used on your system
- The unique security characteristics of each file system

The root (/) file system acts as a foundation for all other file systems on IBM Systems. At a high level, it provides an integrated view of all of the objects on the system. Other file systems that can exist on IBM Systems provide varying approaches to object management and integration, depending on the underlying purpose of each file system. The QOPT (optical) file system, for example, allows system applications and servers to access the CD-ROM drive on the system. Similarly, the QFileSvr.400 file system allows applications to access integrated file system data on remote systems.

The security approach for each file system depends on the data that the file system makes available. The QOPT file system, for example, does not provide object-level security because no technology exists to write authority information to a CD-ROM. For the QFileSvr.400 file system, access control occurs at the remote system, where the files are physically stored and managed. Despite the differing security models, many file systems support consistent management of access control through the integrated file system commands, such as Change Authority (CHGAUT) and Change Owner (CHGOWN).

Securing your printer output queue

Your need to control which users have access to printer output queue and what types of access they have.

1. Type CRTOUTQ (Create Output Queue) and press F4 (Prompt).
2. Fill in the name of the output queue and the library.
3. Press F10 (Additional parameters).
4. Page down to the find the security information for the output queue.
5. Fill in the information from your Output Queue and Workstation Security form to control who can use and manage the output queue.
6. Press the Enter key and check for confirmation messages.

Possible error	Recovery
You pressed the Enter key instead of F10 on step 3.	Use the Change Output Queue (CHGOUTQ) command to enter additional information.
You created the output queue in the wrong library.	Use the Move Object (MOVOBJ) command to move it to the correct library.

You can now assign printer output to an output queue.

Related concepts

Planning printer and printer output queue security
Here are several key points in planning security for the printer and printer output queue, the importance of the planning tasks, and recommendations for completing the tasks.

Securing your workstations

After you secure printer output, you should secure your workstations. You authorize workstations just like you authorize other objects on the system. Use the EDTOBJAUT command to give users authority to workstations.

Your system users have PCs on their desks as their workstations. They use tools that run on the PC, and they use the PC to connect to the server. Most methods of connecting a PC to IBM i systems provide more function than workstation emulation. The PC may look like a display to the system and provide the user

with interactive signon sessions. In addition, the PC may look to IBM i systems like other computers and provide functions such as file transfer and remote procedure call.

As an IBM i system security administrator, you need to be aware of:

- Functions that are available to PC users who are connected to your system
- IBM i system resources that PC users can access

You may want to prevent advanced PC functions, such as file transfer and remote procedure call, if your security scheme is not yet prepared for those functions. Probably, your long-range goal is to allow advanced PC functions while you still protect the information on your system. The topics that follow discuss some of the security issues that are associated with PC access.

Secure workstation data access

Some PC client software uses shared folders to store information on the server. To access system database files, the PC user has a limited, well-defined set of interfaces. With the file transfer capability that is part of most client/server software, the PC user can copy files between the server and the PC. With database access capability; such as a DDM file, remote SQL, or an ODBC driver, the PC user can access data on the server.

In this environment, you can create programs to intercept and evaluate PC-user requests to access server resources. When the requests use a DDM file, you specify the exit program in the distributed data management access (DDMACC) network attribute. For some methods of PC file transfer, you specify the exit program in the client request access (PCSACC) network attribute. Or, you can specify PCSACC (*REGFAC) to use the registration function. When the requests use other server functions to access data, you can use the WRKREGINF command to register exit programs for those server functions.

Exit programs, however, can be difficult to design, and they are rarely foolproof. Exit programs are not a replacement for object authority, which is designed to protect your objects from unauthorized access from any source.

Some client software uses the integrated file system to store and access data on IBM i systems. With the integrated file system, the entire server becomes more easily available to PC users. Object authority becomes even more essential. Through the integrated file system, a user with sufficient authority can view a server library as if it is a PC directory. Simple move and copy commands can instantly move data from a system library to a PC directory or vice versa. The system automatically makes the appropriate changes to the format of the data.

Note: You can use an authorization list to control the use of objects in the QSYS.LIB file system.

The strength of the integrated file system is its simplicity for users and developers. With a single interface, the user can work with objects in multiple environments. The PC user does not need special software or APIs to access objects. Instead, the PC user can use familiar PC commands or "point and click" to work with objects directly.

For all systems that have PCs attached, but particularly for systems that have client software that uses the integrated file system, a good object authority scheme is critical. Because security is integrated into the IBM i product, any request to access data must go through the authority checking process. Authority checking applies to requests from any source and to data access that uses any method.

Object authority with workstation access
When you set up authority for objects, you need to evaluate what that authority provides for the PC user.

For example, when a user has *USE authority to a file, the user can view or print data in the file. The user cannot change information in the file or delete the file. For the PC user, viewing is equivalent to reading, which provides sufficient authority for the user to make a copy of a file on the PC. This may not be what you intend.

For some critical files, you may need to set the public authority to *EXCLUDE to prevent downloading. You can then provide another method to view the file on the server, such as using a menu and programs that adopt authority. Another option to prevent downloading is to use an exit program that runs whenever a PC user starts a server function, other than interactive signon.

You can specify an exit program in the PCSACC network attribute by using the Change Network Attribute (CHGNETA) command. Or, you can register exit programs by using the Work with Registration Information (WRKREGINF) command. The method that you use depends on how PCs are accessing data on your system and which client program the PCs use. The exit program (QIBM_QPWFS_FILE_SERV) applies to IBM i Access and Net Server access to integrated file system. It does not prevent access from a PC with other mechanisms, such as FTP or ODBC.

PC software typically provides upload capability also, so that a user can copy data from the PC to a server database file. If you have not set up your authority scheme correctly, a PC user might overlay all of the data in a file with data from a PC. You need to assign *CHANGE authority carefully. Review the Authority required for objects used by commands topic in Security reference to understand what authority is required for file operations.

Users must have *CHANGE authority to sign on at a workstation. If the QLMTSECOFR system value is no (0), the security officer or anyone with *ALLOBJ authority can sign on at any workstation. If the QLMTSECOFR system value is yes (1), use these guidelines to set authority to workstations:

Users allowed to sign on at workstation	Public authority	QSECOFR authority	Individual user authority
All users	*CHANGE	*CHANGE	Not required
Only selected users	*EXCLUDE	No authority	*CHANGE
Selected users and users with authority to all objects	*EXCLUDE	*CHANGE	*CHANGE
All users except users with authority to all objects	*CHANGE	No authority	Not required

As an IBM Systems security administrator, you need to be aware of the following items:

- Functions that are available to PC users who are connected to your system
- Resources of IBM Systems that PC users can access.

You may want to prevent advanced PC functions, such as file transfer and remote procedure call, if your security scheme is not yet prepared for those functions. Your long-range goals probably include allowing advanced PC functions while you still protect the information on your system.

Before you restrict access to the system operator message queue, use the EDTOBJAUT command to secure workstations, based on the information in your Output Queue and Workstation Security form.

Application administration
Application Administration is available on IBM Navigator for i, the graphical interface for the IBM i product.

Application Administration allows system administrators to control the functions or applications available to users and groups on a specific server. This includes controlling the functions available to users that access their server through clients. It is important to note here, that if you access the server from a Windows client, the IBM i user and not the Windows user determines which functions are available for administration.

Policy administration

Policies are a tool for administrators to use as they configure software on their client PCs. Policies can restrict which functions and applications a user has access to on the PC. Policies can also suggest or mandate configurations to be used by certain users or certain PCs.

Note: Polices do not offer control over server resources. Policies are not a substitute for server security.

Policies are stored on a file server. Each time the user signs on to their Windows workstation, the policies that apply to that Windows user are downloaded from the file server. The policies are applied to the registry before the user does anything on the workstation.

Microsoft policies versus application administration:

Microsoft system policies:

Policies are PC driven, not dependent on specific IBM i releases. Policies can apply to PCs as well as Windows users. This means that users refer to the Windows user profile, not the server user profile. Policies can be used to configure as well as to restrict. Policies typically will offer more granularity than Application Administration and can offer a larger breadth of function. This is because a connection to the server is not needed to determine whether the user can use the function or not. Implementing policies is more complicated than implementing Application Administration because the use of the Microsoft system policy editor is required and PCs must be individually configured to download policies.

IBM Navigator for i application administration:

Application Administration associates data with the user profile, instead of the Windows profile that Microsoft system policies associate with. Application Administration uses the graphical interface of IBM Navigator for i to administer, which is much easier to use than a policy editor. Application Administration information applies to the user regardless of which PC the user signs on from. Particular functions within IBM Navigator for i can be restricted. Application Administration is preferable if all of the functions you want to restrict are enabled by Application Administration, and if the version of the operating system being used supports Application Administration. IBM i Access Client Solutions supports the strategy of implementing administrative control within your network using IBM Navigator for i Application Administration.

Related information

Application Administration

Preventing ODBC access

Open database connectivity (ODBC) is a tool that PC applications can use to access IBM i data as if the data is PC data.

The ODBC programmer can make the physical location of the data transparent to the user of the PC application.

Related information

IBM i Access ODBC

Security considerations for workstation session passwords

Passwords being exchanged between workstations and servers is a great security concern. There are several factors to be considered when planning workstation session password security.

Typically, when a PC user starts the connection software, such as IBM i Access, the user types the user ID and password for the server once. The password is encrypted and stored in PC memory. Whenever the user establishes a new session to the same server, the PC sends the user ID and password automatically.

Some client/server software also provides the option of bypassing the Sign On display for interactive sessions. The software will send the user ID and encrypted password when the user starts an interactive (5250 emulation) session. To support this option, the QRMTSIGN system value on the server must be set to *VERIFY.

When you choose to allow bypassing the Sign On display, you need to consider the security trade-offs.

Security exposure: For 5250 emulation or any other type of interactive session, the Sign On display is the same as any other display. Although the password is not displayed on the screen when it is typed, the password is sent over the link in unencrypted form just like any other data field. For some types of links, this may provide the opportunity for a would-be intruder to monitor the link and to detect a user ID and password. Monitoring a link by using electronic equipment is often referred to as *sniffing*. You can use Secure Sockets Layer (SSL) to encrypt communication between IBM i Access and the IBM i platform. This protects your data, including passwords, from sniffing.

When you choose the option to bypass the Sign On display, the PC encrypts the password before it is sent. Encryption avoids the possibility of having a password stolen by sniffing. However, you must ensure that your PC users practice operational security. An unattended PC with an active session to the system

provides the opportunity for someone to start another session without knowing a user ID and password. PCs should be set up to lock when the system is inactive for an extended period, and they should require a password to resume the session.

Even if you do not choose to bypass the Sign On display, an unattended PC with an active session represents a security exposure. By using PC software, someone can start a server session and access data, again without knowing a user ID and a password. The exposure with 5250 emulation is somewhat greater because it requires less knowledge to start a session and begin accessing data.

You also need to educate your users about the effect of disconnecting their IBM i Access session. Many users assume, logically but incorrectly, that the disconnect option completely stops their connection to the server. In fact, when a user selects the option to disconnect, the server makes the user's session available for another user. However, the client's connection to the server is still open. Another user can walk up to the unprotected PC and access server resources without entering a user ID and password.

You can suggest two options for your users who need to disconnect their sessions:

- Ensure that their PCs have a lockup function that requires a password. Locking makes an unattended PC unavailable to anyone who does not know the password.
- To completely disconnect a session, either log off Windows or restart the PC. This ends the session to the system.

Protecting the IBM i platform from remote commands and procedures
You need to consider how remote commands and procedures can be run on your server.

A knowledgeable PC user with software such as IBM i Access Client Solutions can run commands on the server without going through the Sign On display. The following are several methods that are available for PC users to run server commands. Your client/server software determines the methods that your PC users have available to them.

- A user can open a DDM file and use the remote command function to run a command.
- Some software, such as IBM i Access Client Solutions, provides the remote command function through Distributed Program Call (DPC) APIs, without the use of DDM.
- Some software, such as remote SQL and ODBC, provides a remote command function without either DDM or DPC.

For client/server software that uses DDM for remote command support, you can use the DDMACC network attribute to prevent remote commands completely. For client/server software that uses other server support, you can register exit programs for the server. If you want to allow remote commands, you must make sure that your object authority scheme protects your data adequately. Remote command capability is equivalent to giving a user a command line. In addition, when IBM i receives a remote command through DDM, the system does not enforce the user profiles Limited capability (LMTCPB) setting.

Gateway servers
Your system may participate in a network with an intermediate or gateway server between the IBM i platform and the PCs.

For example, your IBM i platform might be attached to a LAN with a PC server that has PCs that are attached to the server. The security issues in this situation depend on the capabilities of the software that is running on the gateway server. With some software, your IBM i platform will not know about any users (such as USERA or USERC) who are downstream from the gateway server. The server will sign on to the system as a single user (USERGTW). It will use the USERGTW user ID to handle all requests from downstream users. A request from USERA will look to the server like a request from user USERGTW.

If this is the case, you must rely on the gateway server for security enforcement. You must understand and manage the security capabilities of the gateway server. From an IBM i platform perspective, every user has the same authority as the user ID that the gateway server uses to start the session. You might think of this as equivalent to running a program that adopts authority and provides a command line.

With other software, the gateway server passes requests from individual users to IBM i platforms. The IBM i platform knows that USERA is requesting access to a particular object. The gateway is almost transparent to the system.

If your system is in a network that has gateway servers, you need to evaluate how much authority to provide to the user IDs that are used by the gateway servers. You also need to understand the following items:

- The security mechanisms that the gateway servers enforce.
- How downstream users will appear to your IBM i platform.

Wireless LAN communications
Some clients might use the IBM i Wireless LAN to communicate to your system without being physically connected to your system by a wire or cable.

The system's wireless LAN uses radio-frequency communications technology. As a security administrator, you should be aware of the following security characteristics of system wireless LAN products:

- These wireless LAN products use spread spectrum technology. This same technology has been used by the government in the past to secure radio transmissions. To someone who attempts to electronically monitor for data transmissions, the transmissions appear to be noise rather than an actual transmission.
- The wireless connection has three security-relevant configuration parameters:

  - Data rate (two possible data rates)
  - Frequency (five possible frequencies)
  - System identifier (8 million possible identifiers)

  These configuration elements combine to provide 80 million possible configurations, which makes a hacker's likelihood of guessing the correct configuration extremely slim.
- Just like with other communications methods, the security of wireless communications is affected by the security of the client device. The system ID information and other configuration parameters are in a file on the client device and should be protected.
- If a wireless device is lost or stolen, normal server security measures, such as signon passwords and object security, provide protection when an unauthorized user attempts to use the lost or stolen unit to access your system.
- If a wireless client unit is lost or stolen, you should consider changing the system ID information for all users, access points, and systems. Think of this precaution as changing the locks on your doors if a set of keys is stolen.
- You might want to partition your server into groups of clients that have unique system IDs. This limits the effect if a unit is lost or stolen. This method works only if you can confine a group of users to a specific portion of your installation.
- Unlike wired LAN technology, wireless LAN technology is proprietary. Therefore, no electronic sniffers are publicly available for these wireless LAN products. A sniffer is an electronic device that performs unauthorized monitoring of a transmission.

Setting up network security

There are several security recommendations for TCP/IP protocols, such as FTP, BOOTP, and VPN; and for APPC to keep in mind when developing your security plan.

Setting up APPC security

This group of topics discuss various aspects of setting up security for Advanced Program-to-Program Communication (APPC) sessions.

There are several aspects of security for an IBM i platform, communicating using APPC and APPN:

- **Physical security** surrounding the systems, communication lines, and display stations that can be configured.
- **Location security** that verifies the identity of other systems in the network.
- **User security** that verifies the identity and rights of users to issue commands on their local system and remote systems when you specify *NONE for the location password (LOCPWD) parameter during APPC configuration.
- **Resource security** that controls user access to particular resources, such as confidential databases remote system when a session is being established.
- **Session-level security** which is achieved by specifying a password on the LOCPWD parameter during configuration. The IBM i platform uses the password to validate the identity of the remote system when a session is being established.

When the system is using level 10 security, APPC connects to the network as a nonsecure system. The IBM i platform does not validate the identity of a remote system when a session is being established and does not require transaction security on incoming program start requests.

If the IBM i platform is the remote system and is using level 20 or above, APPC connects to the network as a secure system.

Restricting APPC sessions

Use object authority to control access to Advanced Program-to-Program Communication (APPC) sessions.

As security administrator on a source system, you can use object authority to control who can attempt to access other systems. Set the public authority for APPC device descriptions to *EXCLUDE and give *CHANGE authority to specific users. Use the QLMTSECOFR system value to prevent users with *ALLOBJ special authority from using APPC communications.

As security administrator on a target system, you can also use authority to APPC devices to prevent users from starting an APPC session on your system. However, you need to understand what user ID will be attempting to access the APPC device description.

Tip: You can use the Print Publicly Authorized Objects (**PRTPUBAUT *DEVD**) command and the Print Private Authorities (**PRTPVTAUT *DEVD**) command to find out who has authority to device descriptions on your system.

When your system uses APPN, it automatically creates a new APPC device when no existing device is available for the route that the system has chosen. One method for restricting access to APPC devices on a system that is using APPN, is to create an authorization list. The authorization list contains the list of users who should be authorized to APPC devices. You then use the Change Command Default (**CHGCMDDFT**) command to change the **CRTDEVAPPC** command. For the authority (AUT) parameter on the **CRTDEVAPPC** command, set the default value to the authorization list that you created.

You use the location password (**LOCPWD**) parameter in the APPC device description to validate the identity of another system that is requesting a session on your system, on behalf of a user or an application. The location password can help you detect an imposter system.

When you use location passwords, you must coordinate with security administrators for other systems in the network. You must also control who can create or change APPC device descriptions and configuration lists. The system requires *IOSYSCFG special authority to use the commands that work with APPC devices and configuration lists.

Tip: When you use APPN, the location passwords are stored in the QAPPNRMT configuration list rather than in device descriptions.

Target system assignment of user profiles for jobs

When a user requests an APPC job on another system, the request has a mode name associated with it. The mode name might come from the user's request, or it might be a default value from the network attributes of the source system.

The target system uses the mode name and the APPC device name to determine how the job will run. The target system searches the active subsystems for a communications entry that is the best match for the APPC device name and the mode name.

The communications entry specifies what user profile the system will use for SECURITY(NONE) requests. An example of a communications entry in a subsystem description:

```
        Display Communications Entries

Subsystem description: QCMN Status: ACTIVE


            Job                    Default Max
Device    Mode     Description  Library   User    Active
*ALL      *ANY     *USRPRF                *SYS    *NOMAX
*ALL      QPCSUPP  *USRPRF                *NONE   *NOMAX
```

Table 39. Possible values for the default user parameter

Value	Result
*NONE	No default user is available. If the source system does not supply a user ID on the request, the job will not run.
*SYS	Only IBM-supplied programs (system jobs) will run. No user applications will run.
user-name	If the source system does not send a user ID, the job runs under this user profile.

You can use the Print Subsystem Description (**PRTSBSDAUT**) command to print a list of all subsystems that have communications entries with a default user profile.

Display station pass-through options

Display station pass-through is an example of an application that uses APPC. You can use display station pass-through to sign on to another system that is connected to your system through a network.

The Sample pass-through sign–on requests table shows examples of pass-through requests (**STRPASTHR** command) and how the target system handles them. For display station pass-through, the system uses the basic elements of APPC and the remote sign-on (QRMTSIGN) system value.

Table 40. Sample pass-through sign-on requests

Values on STRPASTHR command		Target system		
User ID	Password	SECURELOC value	QRMTSIGN value	Result
*NONE	*NONE	Any	Any	The user must sign on to the target system.
A user profile name	Not entered	Any	Any	The request fails.

Table 40. Sample pass-through sign-on requests (continued)

Values on STRPASTHR command		Target system		
User ID	**Password**	**SECURELOC value**	**QRMTSIGN value**	**Result**
*CURRENT	Not entered	*NO	Any	The request fails.
		*YES	*SAMEPRF	An interactive job starts with the same user profile name as the user profile on the source system. No password is passed to the remote system. The user profile name must exist on the target system.
			*VERIFY	
			*FRCSIGNON	The user must sign on the target system.
		*VFYENCPWD	*SAMEPRF	An interactive job starts with the same user profile name as the user profile on the source system. The source system retrieves the user's password and sends it to the remote system. The user profile name must exist on the target system.
			*VERIFY	
			*FRCSIGNON	The user must sign on the target system.
*CURRENT (or the name of the current user profile for the job)	Entered	Any	*SAMEPRF	An interactive job starts with the same user profile name as the user profile on the source system. The password is sent to the remote system. The user profile name must exist on the target system.
			*VERIFY	
			*FRCSIGNON	The user must sign on the target system.
A user profile name (a name different from the current user profile for the job)	Entered	Any	*SAMEPRF	The request fails.
			*VERIFY	An interactive job starts with the same user profile name as the user profile on the source system. The password is sent to the remote system. The user profile name must exist on the target system.

Table 40. Sample pass-through sign-on requests (continued)				
Values on STRPASTHR command		Target system		
User ID	Password	SECURELOC value	QRMTSIGN value	Result
			*FRCSIGNON	An interactive job starts with the specified user profile name. The password is sent to the remote system. The user profile name must exist on the target system.

Avoiding unexpected device assignments

When a failure occurs on an active device, the system attempts to recover. In some circumstances, when the connection is broken, another user can unintentionally reestablish the session that had the failure.

For example, assume that USERA shut down a workstation without signing off. USERB can turn on the workstation and restart USERA's session without signing on. To prevent this possibility, set the Device I/O Error Action (QDEVRCYACN) system value to *DSCMSG. When a device fails, the system will end the user's job.

Controlling remote commands and batch jobs

Several options are available to help you control which remote commands and jobs can run on your system.

You can use the network job action (JOBACN) network attribute to prevent network jobs from being submitted or to prevent them from running automatically.

If your system uses distributed data management (DDM), you can:

- Restrict access to DDM files to prevent users from using the Submit Remote Command (**SBMRMTCMD**) command from another system. To use the SBMRMTCMD, the user must be able to open a DDM file. You also need to restrict the ability to create DDM files.
- Specify an exit program for the DDM request access (DDMACC) system value. In the exit program, you can evaluate all DDM requests before allowing them.

You can specify explicitly which program requests can run in a communications environment by removing the PGMEVOKE routing entry from subsystem descriptions. The PGMEVOKE routing entry allows the requester to specify the program that runs. When you remove this routing entry from subsystem descriptions, such as the QCMN subsystem description, you must add routing entries for the communications requests that need to run successfully.

For each request that you want to allow, you can add a routing entry with the compare value and the program name both equal to the program name. When you use this method, you need to understand the work management environment on your system and the types of communications requests that occur on your system. If possible, you should test all types of communications requests to ensure that they work properly after you change the routing entries. When a communications request does not find an available routing entry, you receive a CPF1269 message. Another alternative is to set the public authority to *EXCLUDE for the transaction programs that you do not want to run on your system.

Evaluating your APPC configuration

You can use the Print Communications Security (**PRTCMNSEC**) command or menu options to print the security-relevant values in your Advanced Program-to-Program Communication (APPC) configuration.

The topics that follow describe the information about the reports.

Relevant parameters for APPC devices
Refer to these examples of reports for device descriptions and configuration lists as you create your security plan for Advanced Program-to-Program Communication (APPC) devices.

Communications Information Report

```
Communications Information (Full Report)
                                              SYSTEM4
Object type . . . . . . . . . : *DEVD
                                             Pre        SNUF
Object  Object  Device   Secure  Location  APPN    Single  Establish Program
Name    Type    Category Location Password Capable Session Session   Start

CDMDEV1 *DEVD   *APPC     *NO      *NO      *NO     *YES     *NO
CDMDEV2 *DEVD   *APPC     *NO      *NO      *NO     *YES     *NO
```
Figure 3. APPC device descriptions—sample report

Report for configuration lists

```
              Display Configuration List            Page 1

Configuration list . . . . . . . . : QAPPNRMT
Configuration list type  . . . . . : *APPNRMT
Text . . . . . . . . . . . . . . . :
-----------------APPN Remote Locations------------------
          Remote            Remote    Control
Remote    Network  Local    Control   Point     Secure
Location  ID       Location  Point    Net ID    Loc
SYSTEM36  APPN     SYSTEM4  SYSTEM36  APPN       *NO
SYSTEM32  APPN     SYSTEM4  SYSTEM32  APPN       *NO
SYSTEMU   APPN     SYSTEM4  SYSTEM33  APPN       *YES
SYSTEMJ   APPN     SYSTEM4  SYSTEMJ   APPN       *NO
SYSTEMR2  APPN     SYSTEM4  SYSTEM1   APPN       *NO
------------------------APPN Remote Locations--------------------------
          Remote                               Local    Pre-
Remote    Network  Local    Single   Number of  Control  established
Location  ID       Location Session Conversations Point  Session
SYSTEM36  APPN     SYSTEM4   *NO      10          *NO      *NO
SYSTEM32  APPN     SYSTEM4   *NO      10          *NO      *NO
```
Figure 4. Configuration list report example

Parameters for APPC controllers
This topic shows an example of the Communications Information Report for controller descriptions.

```
              Communications Information (full report)

Object type . . . . . . . . . : *CTLD

Object Object Controller Auto  Switched   Call      APPN    CP      Disconnect Delete Device
Name   Type   Category   Create Controller Direction Capable Sessions Timer   Seconds Name
CTL01  *CTLD  *APPC      *YES   *YES       *DIAL     *YES    *YES      0       1440   AARON
CTL02  *CTLD  *APPC      *YES   *YES       *DIAL     *YES    *YES      0       1440   BASIC
```
Figure 5. APPC controller descriptions—sample report

Parameters for line descriptions
This topic shows an example of the Communications Information Report for line descriptions.

```
              Communications Information (Full Report)

Object type . . . . . . . . . : *LIND
Auto
Object  Object  Line     Auto    Delete   Auto    Auto
Name    Type    Category Create  Seconds  Answer  Dial
LINE01  *LIND   *SDLC     *NO      0        *NO     *NO
LINE02  *LIND   *SDLC     *NO      0        *YES    *NO
LINE03  *LIND   *SDLC     *NO      0        *NO     *NO
LINE04  *LIND   *SDLC     *NO      0        *YES    *NO
```
Figure 6. APPC line descriptions—sample report

Setting up TCP/IP security

The following information guides you through the process of setting up TCP/IP security.

Security considerations for using SLIP

TCP/IP support includes Serial Interface Line Protocol (SLIP).

SLIP provides low-cost point-to-point connectivity. A SLIP user can connect to a LAN or a WAN by establishing a point-to-point connection with a system that is part of the LAN or WAN. SLIP runs on an asynchronous connection. You can use SLIP for dial-up connection to and from IBM i platforms.

For example, you might use SLIP to dial in from your PC to an IBM i platform. After the connection is established, you can use the TELNET application on your PC to connect to the IBM i TELNET server. Or, you can use the FTP application to transfer files between the two systems.

No SLIP configuration exists on your system when it ships. Therefore, if you do not want SLIP (and dial-up TCP/IP) to run on your system, do not configure any configuration profiles for SLIP. You use the Work with TCP/IP Point-to-Point (WRKTCPPTP) command to create SLIP configurations. You must have *IOSYSCFG special authority to use the WRKTCPPTP command.

If you want SLIP to run on your system, you create one or more SLIP (point-to-point) configuration profiles. You can create configuration profiles with the following operating modes:

- Dial in (*ANS)
- Dial out (*DIAL)

Note: A user profile is system object that allows signon. Every system job must have a user profile to run. A configuration profile stores information that is used to establish a SLIP connection with an IBM i platform. When you start a SLIP connection to IBM i platforms, you are establishing a link. You have not yet signed on and started an IBM i job. Therefore, you do not necessarily need a user profile to start a SLIP connection to IBM i platforms. However, as you will see in the discussions that follow, the SLIP configuration profile may require a user profile to determine whether to allow the connection.

Securing dial-in SLIP connections

Before someone can establish a dial-in connection to your system with SLIP, you must start a SLIP *ANS configuration profile.

To create or change a SLIP configuration profile, you use the Work with TCP/IP Point-to-Point (**WRKTCPPTP**) command. To start a configuration profile, you use either the Start TCP/IP Point-to-Point (**STRTCPPTP**) command or an option from the WRKTCPPTP display. When your system ships, the public authority for the **STRTCPPTP** and **ENDTCPPTP** commands are *EXCLUDE. The options to add, change, and delete SLIP configuration profiles are available only if you have *IOSYSCFG special authority. As security administrator, you can use both command authority and special authority to determine who can set up your system to allow dial-in connections.

If you want to validate systems that dial in to your system, then you want the requesting system to send a user ID and a password. Your system can then verify the user ID and password. If the user ID and password are not valid, your system can reject the session request. To set up dial-in validation:

1. Create a user profile that the requesting system can use to establish the connection. The user ID and password that the requester sends must match this user profile name and password. **Note:** For the system to perform password validation, the QSECURITY system value must be set to 20 or higher. As additional protection, you probably want to create user profiles specifically for establishing SLIP connections. The user profiles should have limited authority on the system. If you do not plan to use the profiles for any function except establishing SLIP connections, you can set the following values in the user profiles:An initial menu (INLMNU) of *SIGNOFF, An initial program (INLPGM) of *NONE, and Limit capabilities (LMTCPB) of *YES. These values prevent anyone from signing on interactively with the user profile.

2. Create an authorization list for the system to check when a requester tries to establish a SLIP connection. **Note:** You specify this authorization list in the System access authorization list field when you create or change the SLIP profile.

3. Use the Add Authorization Entry (**ADDAUTLE**) command to add the user profile that you created in step 1 to the authorization list. You can create a unique authorization list for each point-to-point configuration profile, or you can create an authorization list that several configuration profiles share.
4. Use the **WRKTCPPTP** command to set up a TCP/IP point-to-point *ANS profile that has the following characteristics:
   a) The configuration profile must use a connection dialog script that includes the user-validation function. User validation includes accepting a user ID and password from the requester and validating them. The system ships with several sample dialog scripts that provide this function.
   b) The configuration profile must specify the name of the authorization list that you created in step 2. The user ID that the connection dialog script receives must be in the authorization list.

Keep in mind that the value of setting up dial-in security is affected by the security practices and capabilities of the systems that dial in. If you require a user ID and password, then the connection dialog box script on the requesting system must send that user ID and password. Some operating systems, such as IBM i, provide a secure method for storing the user IDs and passwords. Other systems store the user ID and password in the script which might be accessible to anyone who knows where to find the script on the system.

Because of the differing security practices and capabilities of your communications partners, you might want to create different configuration profiles for different requesting environments. You use **STRTCPPTP** command to set your system up to accept a session for a specific configuration profile. You can start sessions for some configuration profiles only at certain times of the day, for example. You might use security auditing to log the activity for the associated user profiles.

Preventing dial-in users from accessing other systems
Depending on your system and network configuration, a user who starts a SLIP connection might be able to access another system in your network without signing on to your system.

For example, a user can establish a SLIP connection to your system. Then the user can establish an FTP connection to another system in your network that does not allow dial-in.

You can prevent a SLIP user from accessing other systems in your network by specifying N (No) for the Allow IP datagram forwarding field in the configuration profile. This prevents a user from accessing your network before the user logs on to your system. However, after the user has successfully logged on to your system, the datagram forwarding value has no effect. It does not limit the user's ability to use a TCP/IP application on your IBM i platform (such as FTP or TELNET), to establish a connection with another system in your network.

Controlling dial-out sessions
Before someone can use SLIP to establish a dial-out connection from your system, you must start a SLIP *DIAL configuration profile.

To create or change a SLIP configuration profile, you use the **WRKTCPPTP** command. To start a configuration profile, you use either the Start TCP/IP Point-to-Point (**STRTCPPTP**) command or an option from the WRKTCPPTP display. When your system ships, the public authority for the **STRTCPPTP** and **ENDTCPPTP** commands are *EXCLUDE. The options to add, change, and delete SLIP configuration profiles are available only if you have *IOSYSCFG special authority. As security administrator, you can use both command authority and special authority determine who can set up your system to allow dial-out connections.

Securing dial-out sessions
Users on your IBM i platform might want to establish dial-out connections to systems that require user validation.

The connection dialog script on your IBM i platform must send a user ID and a password to the remote system. IBM i platform provides a secure method for storing that password. The password does not need to be stored in the connection dialog script.

Note:

1. your system decrypts the password before sending it. SLIP passwords, like FTP and TELNET passwords, are sent unencrypted. However, unlike with FTP and TELNET, the SLIP password is sent before the systems establish TCP/IP mode.

2. Because SLIP uses a point-to-point connection in asynchronous mode, the security exposure when sending unencrypted passwords is different from the exposure with FTP and TELNET passwords. Unencrypted FTP and TELNET passwords might be sent as IP traffic on a network and are, therefore, vulnerable to electronic sniffing. The transmission of your SLIP password is as secure as the telephone connection between the two systems. 2. The default file for storing SLIP connection dialog scripts is QUSRSYS/QATOCPPSCR. The public authority for this file is *USE, which prevents public users from changing the default connection dialog scripts.

When you create a connection profile for a remote session that requires validation:

1. Ensure that the Retain Server Security Data (QRETSVRSEC) system value is 1 (Yes). This system value determines whether you will allow passwords that can be decrypted to be stored in a protected area on your system.

2. Use the WRKTCPPTP command to create a configuration profile that has these characteristics:

   a) For the mode of the configuration profile, specify *DIAL.

   b) For the Remote service access name, specify the user ID that the remote system expects. For example, if you are connecting to another IBM i platform, specify the user profile name on that system.

   c) For the Remote service access password, specify the password that the remote system expects for this user ID. On your IBM i platform, this password is stored in a protected area in a form that can be decrypted. The names and passwords that you assign for configuration profiles are associated with the QTCP user profile. The names and passwords are not accessible with any user commands or interfaces. Only registered system programs can access this password information.

      Note: Keep in mind that the passwords for your connection profiles are not saved when you save the TCP/IP configuration files. To save SLIP passwords, you need to use the Save Security Data (SAVSECDTA) command to save the QTCP user profile.

   d) For the connection dialog script, specify a script that sends the user ID and password. The system ships with several sample dialog scripts that provide this function. When the system runs the script, the system retrieves the password, decrypts it, and sends it to the remote system.

Security considerations for using Point-to-Point Protocol

Point-to-point protocol (PPP) is available as part of TCP/IP.

PPP is an industry standard for point-to-point connections that provides additional function over what is available with SLIP. With PPP, your IBM i platform can have high-speed connections directly to an Internet Service Provider or to other systems in an intranet or extranet. Remote LANs can realistically make dial-in connections to your IBM i platform.

Remember that PPP, like SLIP, provides a network connection to your IBM i platform. A PPP connection essentially brings the requester to your system's door. The requester still needs a user ID and password to enter your system and connect to a TCP/IP server like TELNET or FTP. There are security considerations with this new connection capability:

Note: You configure PPP by using IBM Navigator for i.

- PPP provides the ability to have dedicated connections, where the same user always has the same IP address. With a dedicated address, you have the potential for IP spoofing. IP spoofing is when an imposter system that pretends to be a trusted system with a known IP address. However, the enhanced authentication capabilities that PPP provides help protect against IP spoofing.

- With PPP, as with SLIP, you create connection profiles that have a user name and an associated password. However, unlike SLIP, the user does not need to have a valid user profile and password. The user name and password are not associated with a user profile. Instead, validation lists are used for PPP authentication. Additionally, PPP does not require a connection script. The exchange of user name and

password information known as authentication, is part of the PPP architecture and happens at a lower level than with SLIP.

- With PPP, you have the option to use challenge handshake authentication protocol (CHAP). You will no longer need to worry about an eavesdropper sniffing passwords because CHAP encrypts user names and passwords.

Your PPP connection uses CHAP only if both sides have CHAP support. During the exchange signals to set up communications between two modems, the two systems negotiate. For example, if SYSTEMA supports CHAP and SYSTEMB does not, SYSTEMA can either deny the session or agree to use an unencrypted user name and password. Agreeing to use an unencrypted user name and password is referred to as negotiating down.

The decision to negotiate down is a configuration option. On your intranet, for example, where you know that all your systems have CHAP capability, you should configure your connection profile so that it will not negotiate down. On a public connection where your system is dialing out, you might be willing to negotiate down. The connection profile for PPP provides the ability to specify valid IP addresses. You can, for example, indicate that you expect a specific address or range of addresses for a specific user.

This capability, together with the ability for encrypted passwords, provides further protection against spoofing. As additional protection against spoofing or piggy-backing on an active session, you can configure PPP to re-challenge at designated intervals. For example, while a PPP session is active, your IBM i platform might challenge the other system for a user and password. It does this every 15 minutes to ensure that it is the same connection profile.

The end-user will not be aware of this re-challenge activity. The systems exchange names and passwords below the level that the end-user sees. With PPP, it is realistic to expect that remote LANs might establish a dial-in connection to your IBM i platform and to your extended network. In this environment, having IP forwarding turned on is probably a requirement. IP forwarding has the potential to allow an intruder to roam through your network. However, PPP has stronger protections, such as encryption of passwords and IP address validation. This makes it less likely that an intruder can establish a network connection in the first place.

Security considerations for using Bootstrap Protocol server

Bootstrap Protocol (BOOTP) provides a dynamic method for associating workstations with servers and assigning workstation IP addresses and initial program load (IPL) sources.

BOOTP is a TCP/IP protocol used to allow a media-less workstation (client) to request a file containing initial code from a server on the network. The BOOTP server listens on the well known BOOTP server port 67. When a client request is received, the server looks up the IP address defined for the client and returns a reply to the client with the client's IP address and the name of the load file. The client then initiates a TFTP request to the server for the load file. The mapping between the client hardware address and IP address is kept in the BOOTP table on the system.

Preventing BOOTP access
If you do not have any thin clients attached to your network, you do not need to run the BOOTP server on your system.

It can be used for other devices, but the preferred solution for those devices is to use DHCP. To prevent the BOOTP server from running:

1. To prevent BOOTP server jobs from starting automatically when you start TCP/IP, type: CHGBPA AUTOSTART(*NO)

   Notes:

   a. AUTOSTART(*NO) is the default value.

   b. "Control which TCP/IP servers start automatically" on page 120 provides more information about controlling which TCP/IP servers start automatically.

2. To prevent someone from associating a user application, such as a socket application, with the port that the system normally uses for BOOTP:

Notes: Because DHCP and BOOTP use the same port number, this will also inhibit the port that is used by DHCP. Do not restrict the port if you want to use DHCP.

   a) Type GO CFGTCP to display the Configure TCP/IP menu.

   b) Select option 4 (Work with TCP/IP port restrictions).

   c) On the Work with TCP/IP Port Restrictions display, specify option 1 (Add).

   d) For the lower port range, specify 67.

   e) For the upper port range, specify *ONLY.

   Notes:

   a. The port restriction takes effect the next time that you start TCP/IP. If TCP/IP is active when you set the port restrictions, you should end TCP/IP and start it again.

   b. RFC1700 provides information about common port number assignments.

3. For the protocol, specify *UDP.

4. For the user profile field, specify a user profile name that is protected on your system. A protected user profile is a user profile that does not own programs that adopt authority and does not have a password that is known by other users. By restricting the port to a specific user, you automatically exclude all other users.

Securing the BOOTP server

The BOOTP server does not provide direct access to your IBM i platform, and thus represents a limited security exposure.

Your primary concern as a security administrator is to ensure that the correct information is associated with the correct thin client. In other words, a mischief-maker can alter the BOOTP table and cause your thin clients to work incorrectly or not at all.

To administer the BOOTP server and the BOOTP table, you must have *IOSYSCFG special authority. You need to carefully control the user profiles that have *IOSYSCFG special authority on your system.

Security considerations for using DHCP server

These topics discuss methods for securing the dynamic host configuration protocol (DHCP) server for authorized users and preventing access to the DHCP server.

Dynamic host configuration protocol (DHCP) provides a framework for passing configuration information to hosts on a TCP/IP network. For your client workstations, DHCP can provide a function similar to auto configuration. A DHCP-enabled program on the client workstation broadcasts a request for configuration information. If the DHCP server is running on your system, the server responds to the request by sending the information that the client workstation needs to correctly configure TCP/IP.

You can use DHCP to make it simpler for users to connect to your system for the first time. This is because the user does not need to enter TCP/IP configuration information. You can also use DHCP to reduce the number of internal TCP/IP addresses that you need in a subnetwork. The DHCP server can temporarily allocate IP addresses to active users from its pool of IP addresses.

For thin clients, you can use DHCP in place of BOOTP. DHCP provides more function than BOOTP, and it can support dynamic configuration of both thin clients and PCs.

Preventing DHCP access

You may want to prevent users from accessing the DHCP server on your system.

If you do not want anyone to use the DHCP server on your system:

1. To prevent DHCP server jobs from starting automatically when you start TCP/IP, type the following command: CHGDHCPA AUTOSTART(*NO)

   Note: AUTOSTART(*NO) is the default value.

2. To prevent someone from associating a user application, such as a socket application, with the port that the system normally uses for DHCP:

a) Type GO CFGTCP to display the **Configure TCP/IP** menu.

b) Select option **4** (Work with TCP/IP port restrictions).

c) On the Work with TCP/IP Port Restrictions display, specify option **1** (Add).

d) For the lower port range, specify 67.

e) For the upper port range, specify 68.

> **Note:** The port restriction takes effect the next time that you start TCP/IP. If TCP/IP is active when you set the port restrictions, you should end TCP/IP and start it again.

f) For the protocol, specify *UDP.

g) For the user profile field, specify a user profile name that is protected on your system. A protected user profile is a user profile that does not own programs that adopt authority and does not have a password that is known by other users. By restricting the port to a specific user, you automatically exclude all other users.

Securing the DHCP server

There are several recommendations to be aware of when securing the DHCP server.

Security considerations to carry out when you choose to run DHCP on your system:

- Restrict the number of users who have authority to administer DHCP. Administering DHCP requires the following authority:

  - *IOSYSCFG special authority

  - *RW authority to the following files:

    ```
    /QIBM/UserData/OS400/DHCP/dhcpsd.cfg
    /QIBM/UserData/OS400/DHCP/dhcprd.cfg
    ```

- In IBM i 7.1, there is a new and optional DHCP server which can be run. It is based on the Internet System Consortium's (ISC) version 4.0. If you choose to run the new DHCP on your system, you can restrict the number of users who have authority to administer new DHCP. Administering new DHCP requires the following authority:

  - *IOSYSCFG special authority

  - *RW authority to the following files:

    ```
    /QIBM/UserData/OS400/DHCP/ETC/DHCPD.CONF
    /QIBM/UserData/OS400/DHCP/ETC/DHCPD6.CONF
    /QIBM/UserData/OS400/DHCP/ETC/DHCRELAY.CONF
    /QIBM/UserData/OS400/DHCP/ETC/DHCRELAY6.CONF
    /QIBM/UserData/OS400/DHCP/ETC/DHCPD.LEASES
    /QIBM/UserData/OS400/DHCP/ETC/DHCPD6.LEASES
    ```

- Evaluate how physically accessible your LAN is. Can an outsider easily walk into your location with a notebook and physically connect it to your LAN? If this is an exposure, DHCP provides the capability to create a list of clients (hardware addresses) that the DHCP server configures. When you use this feature, you remove some of the productivity benefit that DHCP provides to your network administrators. However, you prevent the system from configuring unknown workstations.

- If possible, use a pool of IP addresses that is reusable, or not created for the Internet. This helps prevent a workstation from outside your network from gaining usable configuration information from the server.

- Use the DHCP exit points if you need additional security protection. An overview of the exit points and their capabilities:

  Port entry
  The system calls your exit program whenever it reads a data packet from port 67 (the DHCP port). Your exit program receives the full data packet. It can decide whether the system processes or discards the packet. You can use this exit point when existing DHCP screening features are not sufficient for your needs.

  Address assignment
  The system calls your exit program whenever DHCP formally assigns an address to a client.

Address release
> The system calls your exit program whenever DHCP formally releases an address and places it back in the address pool.

Security considerations for using TFTP server

These articles discuss methods for securing the trivial file transfer protocol (TFTP) server for authorized users and preventing access to the TFTP server.

Trivial file transfer protocol (TFTP) provides basic file transfer with no user authentication. TFTP works with either Bootstrap Protocol (BOOTP) or Dynamic Host Configuration Protocol (DHCP).

The client connects initially to either the BOOTP server or the DHCP server. The BOOTP server or the DHCP server replies with the client's IP address and the name of the load file. The client then initiates a TFTP request to the server for the load file. When the client completes downloading of the load file, it ends the TFTP session.

Preventing TFTP access
Use the steps outlined here to prevent users from accessing the TFTP server.

If you do not have any thin clients attached to your network, you probably do not need to run the TFTP server on your system. Do the following to prevent the TFTP server from running:

1. To prevent TFTP server jobs from starting automatically when you start TCP/IP, type the following command: CHGTFTPA AUTOSTART(*NO)

   AUTOSTART(*NO) is the default value.
2. To prevent someone from associating a user application, such as a socket application, with the port that the system normally uses for TFTP:
   a) Type GO CFGTCP to display the **Configure TCP/IP** menu.
   b) Select option **4** (Work with TCP/IP port restrictions).
   c) On the Work with TCP/IP Port Restrictions display, specify option **1** (Add).
   d) For the lower port range, specify 69.
   e) For the upper port range, specify *ONLY.

      Note: The port restriction takes effect the next time that you start TCP/IP. If TCP/IP is active when you set the port restrictions, you should end TCP/IP and start it again.
   f) For the protocol, specify *UDP.
   g) For the user profile field, specify a user profile name that is protected on your system. A protected user profile is a user profile that does not own programs that adopt authority and does not have a password that is known by other users. By restricting the port to a specific user, you automatically exclude all other users.

Securing the TFTP server
Consider these recommendations for securing the TFTP server.

By default, the TFTP server provides very limited access to your system. It is specifically configured to provide the initial code for thin clients. As a security administrator, you should be aware of the following characteristics of the TFTP server:

- The TFTP server does not require authentication (a user ID and password). All TFTP jobs run under the QTFTP user profile. The QTFTP user profile does not have a password. Therefore, it is not available for interactive sign-on. The QTFTP user profile does not have any special authorities, nor is it explicitly authorized to system resources. It uses public authority to access the resources that it needs for the thin clients.
- When the TFTP server arrives, it is configured to access the directory that contains thin client information. You must have *PUBLIC or QTFTP authorization to read or write to that directory. To write to the directory you must have *CREATE specified on the **Allow file writes** parameter of the **CHGTFTPA** command. To write to an existing file you must have the *REPLACE specified on the **Allow**

file writes parameter of **CHGTFTPA**. *CREATE allows you to replace existing files or create new files. *REPLACE only allows you to replace existing files.

A TFTP client cannot access any other directory unless you explicitly define the directory with the Change TFTP Attributes (**CHGTFTPA**) command. Therefore, if a local or remote user does attempt to start a TFTP session to your system, the user's ability to access information or cause damage is extremely limited.

- If you choose to configure your TFTP server to provide other services in addition to handling thin clients, you can define an exit program to evaluate and authorize every TFTP request. The TFTP server provides a request validation exit similar to the exit that is available for the FTP server.

Security considerations for using REXEC server

These topics discuss methods for securing the Remote EXECution (REXEC) server for authorized users and preventing access to the REXEC server.

The Remote EXECution server (REXEC) receives and runs commands from an REXEC client. A REXEC client is typically a PC or UNIX application that supports sending REXEC commands. The support that this server provides is similar to the capability that is available when you use the Remote Command (RCMD) sub-command for the FTP server.

Preventing REXEC access
Take these steps to preventing users from accessing the REXEC server.

If you do not want your system to accept commands from an REXEC client, do the following to prevent the REXEC server from running:

1. To prevent REXEC server jobs from starting automatically when you start TCP/IP, type the following command: CHGRXCA AUTOSTART(*NO)

   AUTOSTART(*NO) is the default value.
2. To prevent someone from associating a user application, such as a socket application, with the port that the system normally uses for REXEC:
   a) Type GO CFGTCP to display the **Configure TCP/IP** menu.
   b) Select option **4** (Work with TCP/IP port restrictions).
   c) On the Work with TCP/IP Port Restrictions display, specify option **1** (Add).
   d) For the lower port range, specify 512.
   e) For the upper port range, specify *ONLY.

      Note: The port restriction takes effect the next time that you start TCP/IP. If TCP/IP is active when you set the port restrictions, you should end TCP/IP and start it again.
   f) For the protocol, specify *TCP.
   g) For the user profile field, specify a user profile name that is protected on your system. A protected user profile is a user profile that does not own programs that adopt authority and does not have a password that is known by other users. By restricting the port to a specific user, you automatically exclude all other users.

Securing the REXEC server
Use these recommendations for securing the REXEC server.

Considerations for running the REXEC server on your system:

- An REXCD request includes a user ID, a password, and the command to run. Normal server authentication and authority checking applies:
  - The user profile and password combination must be valid.
  - The system enforces the Limit capabilities (LMTCPB) value for the user profile.
  - The user must be authorized to the command and to all of the resources that the command uses.

- The REXEC server provides exit points similar to the exit points that are available for the FTP server. You can use the Validation exit point to evaluate the command and decide whether to allow it.
- When you choose to run the REXEC server, you are running outside any menu access control that you have on your system. You must ensure that your object authority scheme is adequate to protect your resources.

Security considerations for using DNS server

These articles discuss methods for securing the Domain Name Server (DNS) server for authorized users and preventing access to the DNS server.

DNS is a distributed database system for managing host names and their associated Internet Protocol (IP) addresses. On IBM Systems, the DNS server is intended to provide address translation for the internal, secure network called an intranet. Using DNS means that people can use simple names, such as "www.ibm.com" to locate a host, rather than using the IP address (xxx.xxx.xxx.xxx).

Preventing DNS access

An important part of your security plan is preventing users from accessing the DNS server.

If you do not want anyone to use the DNS server on your system, do the following steps:

1. To prevent DNS server jobs from starting automatically when you start TCP/IP, type: CHGDNSA AUTOSTART(*NO)

   AUTOSTART(*NO) is the default value.

2. To prevent someone from associating a user application, such as a socket application, with the port that the system normally uses for DNS, do the following steps:

   a) Type GO CFGTCP to display the **Configure TCP/IP** menu.

   b) Select option **4** (Work with TCP/IP port restrictions).

   c) On the Work with TCP/IP Port Restrictions display, specify option **1** (Add).

   d) For the lower port range, specify 53.

   e) For the upper port range, specify *ONLY.

      Note: The port restriction takes effect the next time that you start TCP/IP. If TCP/IP is active when you set the port restrictions, you should end TCP/IP and start it again.

   f) For the protocol, specify *TCP.

   g) For the user profile field, specify a user profile name that is protected on your system. A protected user profile is a user profile that does not own programs that adopt authority and does not have a password that is known by other users. By restricting the port to a specific user, you automatically exclude all other users.

   h) Repeat steps 2c through 2g for the user datagram (*UDP) protocol.

Securing the DNS server

You need to secure your DNS server. There are several items that need to be incorporated into your DNS security plan.

Following are security considerations when you choose to run DNS on your system:

- The function that the DNS server provides is IP address translation and name translation. It does not provide any access to objects on your system. Your risk when an outsider accesses your DNS server is that the server provides an easy way to view the topology of your network. Your DNS might save a hacker some effort in determining the addresses of potential targets. However, your DNS does not provide information that will help to break into those target systems.
- Typically, you use the DNS server for your intranet. Therefore, you probably do not have a need to restrict the ability to query the DNS. However, you might, for example, have several subnetworks within your intranet. You might not want users from a different subnetwork to be able to query the DNS on your system. A security option of DNS lets you limit access to a primary domain. Use IBM Navigator for i to specify the IP addresses to which the DNS server should respond.

Another security option lets you specify which secondary servers can copy information from your primary DNS server. When you use this option, your server will accept zone transfer requests (a request to copy information) only from the secondary servers that you explicitly list.

- Be sure to carefully restrict the ability to change the configuration file for your DNS server. Someone with malicious intent can, for example, change your DNS file to point to an IP address outside your network. They can simulate a server in your network and, possibly gain access to confidential information from users that visit the server.
- Restrict the number of users who have authority to administer DNS. Administering DNS requires the following authority:
  - *IOSYSCFG special authority
  - *RW authority to the following files:

    `/QIBM/UserData/OS400/DNS/<instance>/named.conf`
- In IBM i 7.1, the BIND 9 has enhanced certain aspects of security. Refer to Internet System Consortium for more information.

Security considerations for using IBM HTTP server

These topics discuss methods for securing the IBM HTTP server for authorized users and preventing access to the HTTP server.

The HTTP server provides Internet browser clients with access to system multimedia objects, such as Hypertext Markup Language (HTML) documents. It also supports the Common Gateway Interface (CGI) specification. Application programmers can write CGI programs to extend the functionality of the server.

The administrator can use IBM HTTP server to run multiple servers concurrently on the same system. Each server that is running is called a server instance. Each server instance has a unique name. The administrator controls which instances are started and what each instance can do.

Important: You must have the *ADMIN instance of the HTTP server running when you use a Web browser to configure or administer any of the following items:

- WebSphere Application Server
- WebSphere Portal Server
- Integrated Web Application Server
- Integrated Web Services Server
- IBM HTTP Server

A user never sees a system Sign On display. However, the system administrator must explicitly authorize all HTML documents and CGI programs by defining them in HTTP directives. In addition, the administrator can set up both resource security and user authentication (user ID and password) for some or all requests.

An attack by a hacker might result in a denial of service to your Web server. Your server can detect a denial-of-service attack by measuring the timeout of certain clients' requests. If after making the initial client connection, the server does not receive a request from the client, then your server determines that a denial-of-service attack is in progress. The server's default is to detect attacks.

Preventing HTTP access
Use these steps to preventing users from accessing the HTTP server.

If you do not want anyone to use the program to access your system, you should prevent the HTTP server from running. To prevent the HTTP server from running:

1. To prevent HTTP server jobs from starting automatically when you start TCP/IP, type: CHGHTTPA AUTOSTART(*NO)

   AUTOSTART(*NO) is the default value.
2. By default, the HTTP server job uses the QTMHHTTP user profile. To prevent the HTTP server from starting, set the status of the QTMHHTTP user profile to *DISABLED.

Controlling access to the HTTP server

This topic discusses considerations for protecting the contents of your Web site.

The primary purpose of running an HTTP server is to provide access for visitors to a Web site on your system. You might think of someone who visits your Web site as you think of someone who views an advertisement in a trade journal. The visitor is not aware of the hardware and software running your Web site, such as the type of server you are using, and where your server is physically located. Typically, you do not want to put any barrier (such as a Sign On display) between a potential visitor and your Web site. However, you might want to restrict access to some of the documents or CGI programs that your Web site provides.

You might also want a single system to provide multiple logical Web sites. For example, your system might support different branches of your business that have different customer sets. For each of these branches of the business, you want a unique Web site that appears totally independent to the visitor. Additionally, you might want to provide an intranet with confidential information about your business.

As a security administrator, you need to protect the contents of your Web site while, at the same time, you need to ensure that your security practices do not negatively affect the value of your Web site. In addition, you need to ensure that HTTP activity does not jeopardize the integrity of your system or your network.

Administration considerations
This topic introduces several recommendations for securing the Internet server.

Some security considerations for administering your Internet server.:

- You perform setup and configuration functions by using a Web browser and the *ADMIN instance. For some functions, such as creating additional instances on the server, you must use the *ADMIN server.
- The default URL for the administration home page, the home page for the *ADMIN server, is published in the documentation for products that provide browser administration functions. Therefore, the default URL will probably be known by hackers and published in hacker forums, just like the default passwords for IBM-supplied user profiles are known and published. You can protect yourself from this exposure in several ways:
  - Only run the *ADMIN instance of the HTTP server when you need to perform administrative functions. Do not have the *ADMIN instance running all the time.
  - Activate SSL support for the *ADMIN instance, by using Digital Certificate Manager. The *ADMIN instance uses HTTP protection directives to require a user ID and password. When you use SSL, your user ID and password are encrypted, along with all the other information about your configuration that appears on the administration forms.
  - Use a firewall both to prevent access to the *ADMIN server from the Internet and to hide your system and domain names, which are part of the URL.
- When you perform administration functions, you must sign on with a user profile that has *IOSYSCFG and *ALLOBJ special authorities.
- With both the *ADMIN server and TELNET, you have the capability to perform administration functions remotely, perhaps over an Internet connection. Be aware that if you perform administration over a public link, like the Internet, you might be exposing a powerful user ID and password to sniffing. The sniffer can then use this user ID and password to attempt to access your system using, for example, TELNET or FTP.

Notes:

1. TELNET, the Sign On display is treated like any other display. Although the password does not display when you type it, the system transmits it without any encryption or encoding.
2. With the *ADMIN server, the password is encoded not encrypted. The encoding scheme is an industry standard, and thus commonly known among the hacker community. Although the encoding is not easily understood by the casual sniffer, a sophisticated sniffer probably has tools to attempt to decode the password.

Security tip: If you plan to perform remote administration over the Internet, you should use the *ADMIN instance with SSL, so that your transmissions are encrypted. Do not use an unsecure application. If you are using the *ADMIN server across an intranet of trusted users, it is for administration.

Protecting resources
The IBM HTTP server includes HTTP directives that can provide detailed control of the information assets that the server uses. You can use directives to control from which directories the Web server serves URLs for both HTML files and CGI programs, to exchange to other user profiles, and to require authentication for some resources.

Some suggestions for using HTTP directives:

- The HTTP server starts from the basis of *explicit authority*. The server does not accept a request unless that request is explicitly defined in the directives. In other words, the server immediately rejects any request for a URL unless that URL is defined in the directives, either by name or generically.

- You can use protection directives to require a user ID and password before accepting a request for some or all of your resources.

  – When a user (client) requests a protected resource, the server challenges the browser for a user ID and password. The browser prompts the user to enter a user ID and password, and then sends the information to the server. Some browsers store the user ID and password and send them automatically with subsequent requests. This frees the user from repeatedly entering the same user ID and password on each request.

    Because some browsers store the user ID and password, you have the same user education task that you have when users enter your system through the system Sign On display or through a router. An unattended browser session represents a potential security exposure.

  – You have three options for how the system handles user IDs and passwords specified in the protection directives:

    1. You can use normal system user profile and password validation. This is most commonly used to protect resources in an intranet (secure network).

    2. You can create Internet users: users that can be validated but do not have a user profile on the system. Internet users are implemented through a system object called a validation list. Validation list objects contain lists of users and passwords that are specifically defined for use with a particular application.

       You decide how Internet user IDs and passwords are supplied (such as by an application, or by an administrator in response to an e-mail request), as well as how to manage Internet users. Use the HTTP server's browser-based interface to set this up.

       For nonsecure networks (the Internet), using Internet users provides better overall protection than using normal user profiles and passwords. The unique set of user IDs and passwords creates a built-in limitation on what those users can do. The user IDs and passwords are not available for normal sign-on (such as with TELNET or FTP). In addition, you are not exposing normal user IDs and passwords to sniffing.

    3. Lightweight directory access protocol (LDAP) is a directory service protocol that provides access to a directory over a Transmission Control Protocol (TCP). It lets you store information in that directory service and query it. LDAP is now supported as a choice for user authentication.

       Notes:

       - When the browser sends the user ID and the password, whether for an user profile or an Internet user, they are encoded, not encrypted. The encoding scheme is an industry standard, and therefore commonly known among the hacker community. Although the encoding is not easily understood by the casual sniffer, a sophisticated sniffer has tools capable of decoding them.

       - The system stores the validation object in a protected system area. You can access it only with defined system interfaces (APIs) and correct authorization.

- You can use Digital Certificate Manager (DCM) to create your own intranet Certificate Authority. Digital Certificate automatically associates a certificate with the owner's user profile. The certificate has the same authorizations and permissions as the associated profile.
- When the server accepts a request, normal system resource security takes over. The user profile that requests the resource must have authority to the resource, such as the folder or source physical file that contains the HTML document. By default, jobs run under the QTMHHTTP user profile. You can use a directive to exchange to a different user profile. The system then uses that user profile's authority to access objects. Some considerations for this support are:
  - Exchanging user profiles can be particularly useful when your server provides more than one logical Web site. You can associate a different user profile with the directives for each Web site, and use normal system resource security to protect the documents for each site.
  - You can use the ability to exchange user profiles in combination with the validation object. The server uses a unique user ID and password, separate from your normal user ID and password, to evaluate the initial request. After the server has authenticated the user, the system then echanges to a different user profile and thus takes advantage of resource security. The user is not aware of the true user profile name and cannot attempt to use it in other ways, such as FTP.
- Some HTTP server requests need to run a program on the HTTP server. For example, a program might access data on your system. Before the program can run, the server administrator must map the request (URL) to a specific user-defined program that conforms to CGI user-interface standards. Following are some considerations for CGI programs:
  - You can use the protection directives for CGI programs just as you do for HTML documents. Thus, you can require a user ID and password before running the program.
  - By default, CGI programs run under the QTMHHTP1 user profile. You can exchange to a different user profile before running the program. Therefore, you can set up normal system resource security for the resources that your CGI programs access.
  - As security administrator, you should perform a security review before authorizing the use of any CGI program on your system. You should know where the program came from and what functions the CGI program performs. You should also monitor the capabilities of the user profiles under which you run CGI programs. You should also perform testing with CGI programs to determine, for example, whether you can gain access to a command line. Treat CGI programs with the same vigilance that you treat programs that adopt authority.
  - In addition, be sure to evaluate what sensitive objects might have inappropriate public authority. A poorly designed CGI program might allow a knowledgeable, devious user to attempt to roam your system.
  - Use a specific user library, such as CGILIB, to hold all your CGI programs. Use object authority to control both who can place new objects in this library and who can run programs in this library. Use the directives to limit the HTTP server to running CGI programs that are in this library.
- HTTP provides read-only access to your system. HTTP server requests cannot update or delete data on your system directly. However, you might have CGI programs that update data. Additionally, you can enable the Net.Data® CGI program to access your system database. The system uses a script (which is similar to an exit program) to evaluate requests to the Net.Data program. Therefore, the system administrator can control what actions the Net.Data program can take.
- The HTTP server provides an access log that you can use to monitor both accesses and attempted accesses through the server.

Tip: If your server provides multiple logical Web sites, you might want to set up a separate library for the CGI programs for each site.

Security considerations for using SSL with HTTP server

IBM HTTP Server can provide secure Web connections to your system.

A secure web site means that transmissions between the client and the server are encrypted in both directions. These encrypted transmissions are safe both from the scrutiny of sniffers and from those who attempt either to capture or to alter the transmissions.

Note: Keep in mind that a secure Web site applies strictly to the security of the information that passes between client and server. The intent of this is not to reduce your server's vulnerability to hackers. However, it certainly limits the information that a would-be hacker can obtain easily through sniffing.

The topics on SSL and Webserving (HTTP) in the information center provides complete information for installing, configuring, and managing the encryption process. These topics provide both an overview of the server features and some considerations for using the server.

Security that depends on encryption has several requirements:

- Both the sender and receiver (server and client) must understand the encryption mechanism and be able to perform encryption and decryption. The HTTP server requires an SSL-enabled client. Most popular Web browsers are SSL-enabled. The IBM i encryption licensed programs support several industry-standard encryption methods. When a client attempts to establish a secure session, the server and client negotiate to find the most secure encryption method that both of them support.
- The transmission must not be able to be decrypted by an eavesdropper. Thus, encryption methods require both parties to have an encryption/decryption private key that only they know. If you want to have a secure external Web site, you should use an independent certificate authority (CA) to create and issue digital certificates to users and servers. The certificate authority is known as a trusted party.

Encryption protects the confidentiality of transmitted information. However, for sensitive information, such as financial information, you want integrity and authenticity in addition to confidentiality. The client and (optionally) the server must trust the party on the other end (through an independent reference) and they must be sure that the transmission has not been altered. The digital signature that is provided by a certification authority (CA) provides these assurances of authenticity and integrity. The SSL protocol provides authentication by verifying the digital signature of the server's certificate (and optionally the client's certificate).

Encryption and decryption require processing time and will affect the performance of your transmissions. Therefore, IBM i products provide the capability to run both the programs for secure and insecure serving at the same time. You can use the insecure HTTP server to serve documents that do not require security, such as your product catalog. These documents will have a URL that starts with http://. You can use a secure HTTP server for sensitive information such as the form where the customer enters credit card information. The program can serve documents whose URL starts either with http:// or with https://.

Reminder: Keep in mind that encryption requires both a secure client and a secure server. It is good Internet etiquette to inform your clients when transmissions are secure and not secure, particularly when your Web site only uses a secure server for some documents.

Security considerations for LDAP

Lightweight Directory Access Protocol (LDAP) security features include Secure Sockets Layer (SSL), Acess Control Lists, and CRAM-MD5 password encryption.

In V5R1, Kerberos connections and Security auditing support were added to enhance LDAP security. See Directory Server (LDAP) or more information about these topics.

Security considerations for LPD

LPD (line printer daemon) provides the capability to distribute printer output to your system. The system does not perform any sign-on processing for LPD.

Preventing LPD access
These instructions explain how to prevent LDP access.

If you do not want anyone to use LPD to access your system, you should prevent the LPD server from running:

1. To prevent LPD server jobs from starting automatically when you start TCP/IP, type: CHGLPDA AUTOSTART(*NO)

    Notes:

a. AUTOSTART(*YES) is the default value.

b. Control which TCP/IP servers start automatically provides more information about controlling which TCP/IP servers start automatically.

2. To prevent someone from associating a user application, such as a socket application, with the port that the system normally uses for LPD:

   a) Type GO CFGTCP to display the Configure TCP/IP menu.

   b) Select option 4 (Work with TCP/IP port restrictions).

   c) On the Work with TCP/IP Port Restrictions display, specify option 1 (Add).

   d) For the lower port range, specify 515.

   e) For the upper port range, specify *ONLY.

   Notes:

   - The port restriction takes effect the next time that you start TCP/IP. If TCP/IP is active when you set the port restrictions, you should end TCP/IP and start it again.
   - RFC1700 provides information about common port number assignments.

3. For the protocol, specify *TCP.

4. For the user profile field, specify a user profile name that is protected on your system. A protected user profile is a user profile that does not own programs that adopt authority and does not have a password that is known by other users. By restricting the port to a specific user, you automatically exclude all other users.

5. Repeat steps 2c through 2g for the *UDP protocol.

Controlling LPD access

If you want to allow LPD clients to access your system, there are security issues to be aware of.

These security issues are important for you to be aware of:

- To prevent a user from swamping your system with unwanted objects, be sure that you have set adequate threshold limits for your auxiliary storage pools (ASPs). You can display and set the thresholds for ASPs by using either system service tools (SST) or dedicated service tools (DST). The Backup and Recovery book provides more information about ASP thresholds.
- You can use the authority to output queues to restrict who can send spooled files to your system. LPD users without a user ID use the QTMPLPD user profile. You can give this user profile access to only a few output queues.

Security considerations for SNMP

The simple network management protocol (SNMP) provides a means for managing the gateways, routers, and hosts in a network environment.

The system can act as a simple network management protocol (SNMP) agent in a network. An SNMP agent gathers information about the system and performs functions that remote SNMP network managers request.

Preventing SNMP access

Use these instructions to prevent SNMP access to your system.

If you do not want anyone to use SNMP to access your system, you should prevent the SNMP server from running:

1. To prevent SNMP server jobs from starting automatically when you start TCP/IP, type: CHGSNMPA AUTOSTART(*NO)

   Notes:

   a. AUTOSTART(*YES) is the default value.

b. Control which TCP/IP servers start automatically provides more information about controlling which TCP/IP servers start automatically.

2. To prevent someone from associating a user application, such as a socket application, with the port that the system normally uses for SNMP:

   a) Type GO CFGTCP to display the Configure TCP/IP menu.

   b) Select option 4 (Work with TCP/IP port restrictions).

   c) On the Work with TCP/IP Port Restrictions display, specify option 1 (Add).

   d) For the lower port range, specify 161.

   e) For the upper port range, specify *ONLY.

   Notes:

   - The port restriction takes effect the next time that you start TCP/IP. If TCP/IP is active when you set the port restrictions, you should end TCP/IP and start it again.
   - RFC1700 provides information about common port number assignments.

3. For the protocol, specify *TCP.

4. For the user profile field, specify a user profile name that is protected on your system. A protected user profile is a user profile that does not own programs that adopt authority and does not have a password that is known by other users. By restricting the port to a specific user, you automatically exclude all other users.

5. Repeat steps 2c through 2g for the *UDP protocol.

Controlling SNMP access

If you want to allow SNMP managers to access your system, you need to be aware of some security issues.

- Someone who can access your network with SNMP can gather information about your network. Information that you have hidden by using aliases and a domain-name server becomes available to the would-be intruder through SNMP. Additionally, an intruder might use SNMP to alter your network configuration and disrupt your communications.

- SNMP relies on a community name for access. Conceptually, the community name is similar to a password. The community name is not encrypted. Therefore, it is vulnerable to sniffing. Use the Add Community for SNMP (ADDCOMSNMP) command to set the manager internet address (INTNETADR) parameter to one or more specific IP addresses instead of *ANY. You can also set the OBJACC parameter of the ADDCOMSNMP or CHGCOMSNMP commands to *NONE to prevent the managers in a community from accessing any MIB objects. Resetting the OBJACC parameter is intended to just be done temporarily to deny access to managers in a community without removing the community.

- As of IBM i 7.1, a network administrator can restrict access to MIB objects based on the user names. In addition, SNMP server supports authentication and privacy of messages. To increase security, SNMP agent offers the ability to use HMAC-MD5 and HMAC-SHA encryption protocols for the authentication and CBC-DES encryption protocol for the privacy when communicating with a Network Manager System or agent. In order to enable authentication and privacy, use the Configure TCP/IP SNMP (CFGTCPSNMP) command to work with the users and their objects based on a community name. In order to achieve this, you should first use the Change SNMP Attributes (CHGSNMPA) command specifying *YES for the ALWSNMPV3 parameter to enable SNMPV3 features.

Security considerations for INETD server

Unlike most TCP/IP servers, the INETD server does not provide one single service to clients.

The INETD server provides a variety of miscellaneous services that administrators can customize. For that reason, the INETD server is sometimes called "the super server". The INETD server has several built-in services:

- Time
- Daytime

- Echo
- Discard
- Changed

These services are supported for both TCP and UDP. For UDP, the echo, time, daytime, and changed services receive UDP packets, then send the packets back to the originator. The echo server echoes back packets that it receives, the time and daytime servers generate the time in a specific format and send it back, and the changed server generates a packet of printable ASCII characters and sends it back.

The nature of these UDP services makes a system vulnerable to a denial of service attack. For example, assume that you have two IBM i platforms: SYSTEMA and SYSTEMB. A malicious programmer might forge the IP header and the UDP header with a source address of SYSTEMA and a UDP port number of the time server. He can then send that packet to the time server on SYSTEMB, which will send the time to SYSTEMA, which will respond back to SYSTEMB, and so on, generating a continuous loop and consuming CPU resources on both systems, as well as network bandwidth.

Therefore, you should consider the risk of such an attack on your IBM i platform, and only run these services on a secure network. The INETD server is shipped to not be auto started when you start TCP/IP. You can configure whether to start the services when INETD is started. By default, the TCP and UDP time servers and daytime servers are both started when you start the INETD server.

There are two configuration files for the INETD server:

`/QIBM/UserData/OS400/inetd/inetd.conf` and

`/QIBM/ProdData/OS400/inetd/inetd.conf`

These files determine what programs start when the INETD server starts. They also determine what user profile these programs are running under when INETD starts them.

Note: The configuration file in proddata should never be modified. It is replaced each time the system is reloaded. Customer configuration changes should only be placed in the file, in the UserData directory tree, as this file in not updated during release upgrades.

If a malicious programmer got access to these files, they can configure them to start any program when INETD started. Therefore it is very important to protect these files. By default they require QSECOFR authority to make changes. You should not reduce the authority required to access them.

Security considerations for limiting TCP/IP roaming

If your system is connected to a network, you may want to limit your users' ability to roam the network with TCP/IP applications.

One way to do this is to restrict access to the following client TCP/IP commands:

Note: These commands might exist in several libraries on your system. They are in both the QSYS library and the QTCP library, at a minimum. Be sure to locate and secure all occurrences.

- STRTCPFTP
- FTP
- STRTCPTELN
- TELNET
- LPR
- SNDTCPSPLF
- RUNRMTCMD (REXEC client)

Your users' possible destinations are determined by the following factors:

- Entries in your TCP/IP host table.
- *DFTROUTE entry in the TCP/IP route table. This allows users to enter the IP address of the next-hop system when their destination is an unknown network. A user can reach or contact a remote network by using the default route.

- Remote name server configuration. This support allows another server in the network to locate host names for your users.
- Remote system table.

You need to control who can add entries to these tables and change your configuration. You also need to understand the implications of your table entries and your configuration.

Be aware that a knowledgeable user with access to an ILE C compiler can create a socket program capable of attaching to a TCP or UDP port. You can make this more difficult by restricting access to these socket interface files in the QSYSINC library:

- SYS
- NETINET
- H
- ARPA
- Sockets and SSL

For service programs, you can restrict use of socket and SSL applications that are already compiled by restricting use of these service programs:

- QSOSRV1
- QSOSRV2
- QSOSSLSR(SSL)

The service programs are shipped with public authority *USE, but the authority can be changed to *EXCLUDE, or another value as needed.

Security considerations for using RouteD

Keep in mind the security considerations for using the Route Daemon (RouteD) server. RouteD, provides support for the Routing Information Protocol on the system.

The Route Daemon (RouteD) server provides support for the Routing Information Protocol (RIP) on IBM Systems. RIP is the most widely used of routing protocols. It is an Interior Gateway Protocol that assists TCP/IP in the routing of IP packets within an autonomous system.

RouteD is intended to increase the efficiency of network traffic by allowing systems within a trusted network to update each other with current route information. When you run RouteD, your system can receive updates from other participating systems about how transmission packets should be routed. Therefore, if your RouteD server is accessible to a hacker, the hacker might use it to reroute your packets through a system that can sniff or change those packets. Suggestions for RouteD security:

- IBM Systems use RIPv1, which does not provide any method for authenticating routers. It is intended for use within a trusted network. If your system is in a network with other systems that you do not trust, you should not run the RouteD server. To ensure that the RouteD server does not start automatically, type: CHGRTDA AUTOSTART(*NO)
- Make sure that you control who can change the RouteD configuration, which requires *IOSYSCFG special authority.
- If your system participates in more than one network, you can configure the RouteD server to send and accept updates only with the secure network.

Managing security

Once you've planned and implemented your security strategy, there remains the task of managing the security of your system.

These topics will guide you through setting up your security management plan:

- Back up and recover security information
- Manage security information

- Manage service tools user IDs
- Protect against computer viruses

Restricting save and restore capability

Part of your security system should be controlling users' save and restore capabilities.

Most users do not need to save and restore objects on your system. The save commands provide the possibility of copying important assets of your organization to media or to another system. Most save commands support save files that can be sent to another system, by using the SNDNETF file command, without having access to media or a save/restore device.

Restore commands provide the opportunity to restore unauthorized objects, such as programs, commands, and files, to your system. You can also restore information without access to media or to a save/restore device by using save files. Save files can be sent from another system by using the SNDNETF command or by using the FTP function.

Suggestions for restricting save and restore operations on your system:

- Control which users have *SAVSYS special authority. *SAVSYS special authority allows the user to save and restore objects even when the user does not have the necessary authority to the objects.
- Control physical access to save and restore devices.
- Restrict access to the save and restore commands. When you install IBM i licensed programs, the public authority for the RSTxxx commands is *EXCLUDE. Public authority for the SAVxxx commands is *USE. Consider changing the public authority for SAVxxx commands to *EXCLUDE. Carefully limit the users that you authorize to the RSTxxx commands.
- Use the QALWOBJRST system value to restrict restoration of system-state programs, programs that adopt authority, and objects that have validation errors.
- Use the QVFYOBJRST system value to control restoring signed objects on your system.
- Use the QFRCCVNRST system value to control the recreation of certain objects being restored on your system.
- Use security auditing to monitor restore operations. Include *SAVRST in the QAUDLVL system value, and periodically print audit records that are created by restore operations.

Saving security information

You need to plan how you will save and restore security information.

When you plan the backup and recovery of your system, you need to consider the security of your information as well as the information itself. See the Information Center topic, Backup, Recovery, and Availability to help you design a complete backup and recovery plan. You need to back up and restore the security information that you create when you set up security.

Related concepts

User security
From a user's point of view, security affects how they use and complete tasks on the system.

Save system values

System values are stored in the system library, QSYS. You must save the QSYS library in order to retrieve the system values you have set should you need to recover your system.

You save the QSYS library when you:

- Use the Save System (**SAVSYS**) command.
- Use the option to save the entire system from the Save menu.
- Use the option to save system information from the Save menu.
- Use the option to back up the entire system from the Run Backup (RUNBCKUP) menu.

If you need to recover your entire system, you automatically restore your system values when you restore your operating system.

Whenever library QUSRSYS is saved with the Save Library (SAVLIB) or Save Changed Objects (SAVCHGOBJ) commands, the current system information is retrieved and saved. The system information saved is the same data which is retrieved by the Retrieve System Information (RTVSYSINF) command. If a system needs to be reloaded from distribution media, the system information can be updated by restoring the user information and then running UPDSYSINF LIB(QUSRSYS).

Related concepts
Saving group and user profiles
Group and user profiles are stored in the QSYS library. You save them when you use the Save System (SAVSYS) command or select the menu option to save the entire system.

Related information
Saving IBM i information command

Saving group and user profiles

Group and user profiles are stored in the QSYS library. You save them when you use the Save System (SAVSYS) command or select the menu option to save the entire system.

You can also save group and user profiles by using the Save Security Data (**SAVSECDTA**) command. Restore user profiles by using the Restore User Profile (**RSTUSRPRF**) command. The normal sequence is:

1. Restore the operating system, which restores library QSYS
2. Restore user profiles
3. Restore the remaining libraries
4. Restore authority to objects using the Authority (**RSTAUT**) command

Related concepts
Save system values
System values are stored in the system library, QSYS. You must save the QSYS library in order to retrieve the system values you have set should you need to recover your system.

Saving job descriptions

When you create a job description, you specify a library where it should reside. IBM recommends creating job descriptions into the QGPL library.

You can save job descriptions by saving the library in which they reside. Use the Save Library (**SAVLIB**) command to do this. You can also save a job description by using the Save Object (**SAVOBJ**) command.

You can restore the contents of a library by using the Restore Library (**RSTLIB**) command. You can restore an individual job description by using the Restore Object (**RSTOBJ**) command.

Saving resource security information

Resource security defines how users can work with objects, consists of different types of information that is stored in several different places.

Table 41. Resource security information storage locations			
Type of information	**Where it is stored**	**How it is saved**	**How it is restored**
Public authority	With the object	SAVxxx command[1]	RSTxxx command[2]
Object auditing value	With the object	SAVxxx command[1]	RSTxxx command[2]
Object ownership	With the object	SAVxxx command[1]	RSTxxx command[2]
Primary group	With the object	SAVxxx command[1]	RSTxxx command[2]

Table 41. Resource security information storage locations (continued)			
Type of information	**Where it is stored**	**How it is saved**	**How it is restored**
Authorization list	QSYS library	SAVSYS or SAVSECDTA	RSTUSRPRF, USRPRF (*ALL)
Link between object and authorization list	With the object	SAVxxx command[1]	RSTxxx command[2]
Private authority	With the user profile	SAVSYS, SAVSECDTA, or SAVXXX command	RSTAUT or RSTXXX command

1

You can save most object types by using the SAVOBJ or SAVLIB commands. Some object types, such as configurations, have a special save command.

2

You can restore most object types by using the RSTOBJ or RSTLIB commands. Some object types, such as configurations, have a special restore command.

When you need to recover an application or your entire system, you need to plan the steps carefully, including recovery of the authority to objects. The basic steps necessary to recover the resource security information for an application are:

1. If necessary, restore user profiles, including the profiles which own the application. You can restore specific profiles or all profiles with the RSTUSRPRF command.
2. Restore any authorization lists that are used by the application. You restore authorization lists when you use RSTUSRPRF USRPRF(*ALL).

   Note: This restores all the user profile values, including passwords, from the backup media.
3. Restore the application libraries by using the RSTLIB or RSTOBJ command. This recovers object ownership, public authority, and the links between objects and authorization lists.
4. Restore private authority to objects by using the RSTAUT command. The RSTAUT command also restores user authorities to authorization lists. You can restore authority for specific users or all users.

Saving the default owner profile (QDFTOWN)

If you restore an object and the owner profile is not on the system, the system transfers ownership of the object to a default profile that is called QDFTOWN.

Once you recover the owner profile or create it again, you can transfer ownership back by using the Work with Object by Owner (**WRKOBJOWN**) command.

Restoring security information

Recovering your system often requires restoring data and associated security information.

The typical sequence for recovery is:

1. Restore user profiles and authorization lists (RSTUSRPRF USRPRF(*ALL)).
2. Restore objects (RSTLIB, RSTOBJ, or RSTCFG).
3. Restore the private authorities to objects (RSTAUT).

Restoring user profiles
The system might make some changes to a user profile when the profile is restored.

Restoring objects
When you restore an object to the system, the system uses the authority information stored with the object. This topic describes the rules applicable to the authority information when restoring objects.

Restoring authority

When security information is restored, private authorities must be rebuilt. When you restore a user profile that has an authority table, the authority table for the profile is also restored.

Restoring programs

Restoring programs that are obtained from an unknown source poses a security exposure. This topic provides information about the factors that should be taken into consideration when restoring programs to your system.

Restoring licensed programs

The Restore Licensed Programs (**RSTLICPGM**) command is used to install IBM-supplied programs on your system. It can also be used to install non-IBM programs that were created by using the IBM System Manager for IBM i licensed program.

Restoring authorization lists

No method exists for restoring an individual authorization list. When you restore an authorization list, authority and ownership are established just as they are for any other object that is restored.

Restoring the operating system

When you perform a manual IPL on your system, the IPL or Install the System menu provides an option to install the operating system. The dedicated service tools (DST) function provides the ability to require anyone using this menu option to enter the DST security password. You can use this to prevent someone from restoring an unauthorized copy of the operating system.

Managing security information

How you will manage your security information is an important part of your security plan.

Now that you have planned the security for your system, you need to ensure that your plan remains effective as your business needs change. This topic emphasizes simplicity as an essential goal in designing security. You have designed user groups as patterns for individual users. You have tried to use public authority, authorization lists, and library authority rather than specific individual authorities. Take advantage of that approach as you manage security:

- When you add a new user group or a new application, use the techniques that you used to plan security.
- When you need to make changes to security, try to take a general approach rather than creating an exception to solve a specific problem.

Working with security commands

You can use security commands to display, change, and delete security information.

The table below shows what commands you use to work with security objects on the system. You can use these commands to:

- View and list security information.
- Change security information.
- Delete security information.

Table 42. Security Commands			
Security Object	**How to View**	**How to Change**	**How to Delete**
System Value	WRKSYSVAL DSPSYSVAL	WRKSYSVAL CHGSYSVAL	Cannot be deleted
Job Description	WRKJOBD DSPJOBD	WRKJOBD CHGJOBD	DLTJOBD
Group Profile	WRKUSRPRF DSPUSRPRF DSPAUTUSR	WRKUSRPRF CHGUSRPRF	DLTUSRPRF[1, 2]
User Profile	WRKUSRPRF DSPUSRPRF DSPAUTUSR	WRKUSRPRF CHGUSRPRF CHGUSRAUD	DLTUSRPRF[1]

Table 42. Security Commands (continued)			
Security Object	**How to View**	**How to Change**	**How to Delete**
Object Authorities	DSPAUT DSPOBJAUT DSPUSRPRF TYPE(*OBJAUT)	CHGAUT EDTOBJAUT GRTOBJAUT WRKAUT	EDTOBJAUT RVKOBJAUT WRKAUT
Object Ownership	WRKOBJOWN DSPOBJAUT DSPUSRPRF TYPE(*OBJOWN)	CHGOBJOWN CHGOWN	CHGOBJOWN CHGOWN allows you to revoke the rights of the previous owner.
Primary Group	DSPOBJAUT WRKOBJPGP DSPUSRPRF TYPE(*OBJPGP)	CHGOBJPGP CHGPGP	CHGOBJPGP CHGPGP set primary group to *NONE
Object Auditing	DSPOBJD	CHGOBJAUD CHGAUD	CHGOBJAUD (set to *NONE) CHGAUD
Authorization List	DSPAUTL DSPAUTLOBJ	EDTAUTL (user authority to a list) EDTOBJAUT (object secured by list) ADDAUTLE CHGAUTLE GRTOBJAUT	DLTAUTL (entire list)[3] RMVAUTLE (remove user authority to the list) EDTOBJAUT (object secured by list) RVKOBJAUT

1. IBM recommends using the remove option from the Work with User Enrollment display for deleting a profile. Using this option, you can delete any objects that are owned by the profile or reassign them to a new owner. Certain DLTUSRPRF command parameters allow you to delete all objects that are owned by the user or assign them all to a new owner. You cannot delete a profile unless you delete or reassign owned objects. You also cannot delete a profile that is the primary group for any objects.

2. You cannot delete a group profile that has any members. Use the *GRPMBR option of the DSPUSRPRF command to list the members of the group. Change the Group Profile field in each of the individual group profiles before deleting the group profile.

3. You cannot delete an authorization list that is used to secure objects. Use the DSPAUTLOBJ command to list the objects that are secured by the list. Change the authority of any objects that are secured by the list by using the EDTOBJAUT command.

Viewing and listing security information

You can list security information by using a display (DSP) command with a print (*PRINT) option. For example, to display an authorization list called MYLIST, type DSPAUTL MYLIST *PRINT.

Some display commands provide options for different types of lists. For example, when you created individual user profiles, you used the *GRPMBR option of the DSPUSRPRF command to list all the members of a group profile. Use prompting (F4) and online information to find out what lists are available for security objects.

You can use the Display commands to view security information at your display station. You can also use the Work with... (WRK) commands, which provide more function. The Work With... commands give you a list display. You can use this display to change, delete, and view information.

You can also use security commands to list or view information by using a generic name. If you type WRKUSRPRF DPT*, your Work with User Enrollment display or Work with User Profile display shows only profiles that start with the characters *DPT*. Use online information for a command to find out which parameters allow generic names.

Changing security information

You can change security information interactively by using a Work With... (WRK) or Edit... (EDT) command. You can view the information, change it, and view the information again after the change.

You can also change security information without viewing it before and after the change by using a Change... (CHG) or Grant... (GRT) command. This method is particularly useful for making a change to more than one object at a time. For example, you used the GRTOBJAUT command to set public authority for all the objects in a library.

Deleting security information

You can delete or remove certain types of security information interactively by using the Work with... (WRK) or Edit... (EDT) commands. You can also use Delete... (DLT), Remove... (RMV), and Revoke... (RVK) commands to delete security information. Often, you must meet certain conditions before the system allows you to delete security information.

Adding a new user to the system

As a security officer you will need to know how to add new users to the system.

You might need to create new user groups for several reasons:

- Additional departments need to use the system.
- You discover that you need to make user groups more specific to meet your resource security needs.
- Your company reorganized some departments.

When you need to add a new user to the system:

1. Assign the person to a user group. Use the User Group Description worksheet for reference.
2. Decide if the new user needs to perform system functions. If so, add that information to the System Responsibilities form.
3. Add the person to the Individual User Profile form.
4. Review the System Responsibilities worksheet and the User Group Description worksheet to determine if the new user needs settings that are different from those of the group.
5. Create a user profile by copying the group profile or the profile of a group member. Be sure to set the password to expire.
6. Give the new user a copy of your security memo.

Adding a new application

You will use this procedure to add new applications to your system.

You should plan the security for any new applications as carefully as you planned for your original applications.

1. Prepare an Application Description worksheet and Library Description worksheet for the application.
2. Update your diagram of applications, libraries, and user groups.
3. Follow the procedures in "Planning resource security" to decide how to secure the new application.
4. Prepare an Application Installation worksheet by using the method described in "Planning your application installation."
5. Evaluate whether any printer output from the application is confidential and needs protection. Update your Output Queue and Workstation Security worksheet, if necessary.
6. Follow the steps described in "Setting up ownership and public authority" and "Setting up resource security" to install and secure the application.

Adding a new workstation

Here is the information you will need to add new workstations to your system.

When you add a new workstation to your system, consider security requirements:

1. Does the physical location of a new workstation pose any security risks? (See "Planning physical security" for more information.)

2. If the workstation does pose a risk, update your Output Queue and Workstation Security worksheet.

3. You should normally create new workstations with public authority *CHANGE. If this does not meet your security requirements for the workstation, use the EDTOBJAUT command to specify a different authority.

Changing a user group

There will be times when a user group needs to be updated or the authorities of a user group need to be changed.

You will need to handle different types of changes to the characteristics of a group in different ways. Presented here are some examples of changes and how to deal with them.

Changing the group's authority

You may discover that the group needs authority to objects that you did not anticipate in your initial planning.

1. Use the Edit Object Authority (EDTOBJAUT) command to give the group the correct access to the objects or to an appropriate authorization list. "Setting up specific authorities" shows an example of how to do this. Every member of the group gets authority to the object when you give the group authority.

2. If you give the group authority to a confidential resource, you may want to verify the current members of the group. Use the Display User Profile command (DSPUSRPRF group-profile-name *GRPMBR) to list the group members.

Changing the customizing for the group

You may need to change the user environment setup for members of a group. For example, if a department gets its own printer, you want the new printer to be the default for the members of that department's user group. Or, when your system gets a new application installed, members of a user group may want a different initial menu when they sign-on.

The group profile provides a pattern that you can copy to create individual profiles for group members. The customizing values in the group profile do not affect the individual user profiles after you create them, however. For example, changing a field, such as Printer device in the group profile, has no affect on the group members. You need to change the Printer device field in each individual user profile.

You can use the Work with User Profile display to change a parameter for more than one user at a time. The example shows changing the output queue for all members of a group:

1. Type WRKUSRPRF *ALL and press the Enter key.

2. If you see the Work with User Enrollment display, use F21 (Select assistance level) to change to the Work with User Profile display.

```
                 Work with User Profiles

Type options, press Enter.
  1=Create  2=Change  3=Copy  4=Delete  5=Display
  12=Work with objects by owner

      User
Opt  Profile    Text
      HARRISOK  Harrison, Keith
2     HOGANR    Hogan, Richard
      JONESS    Jones, Sharon
2     WILLISR   Willis, Rose
.
.
                                      More...
Parameters for options 1, 2, 3, 4 and 5 or command
===> PRTDEV(PRT02)
F3=Exit  F5=Refresh  F12=Cancel  F16=Repeat position to  F17=Position to
F21=Select assistance level  F24=More keys
```

3. Type a 2 (Change) next to each profile that you want to change.

4. On the parameter line at the bottom of the display, type the parameter name and the new value. If you do not know the parameter name, press F4 (Prompt).

5. Press the Enter key. You receive a confirmation message for each profile that changed. Although changing a customizing field in the group profile has no affect on the group members, it may help you in the future. The group profile provides a pattern when you want to add members to the group later. It is also a record of the standard field values for the group.

Giving the group access to a new application

When a user group needs access to a new application, you need to analyze information about the group and about the application. The suggested method:

1. Look at the Application Description worksheet for the new application and your diagram of applications, libraries, and user groups to see which libraries the application uses. Add those libraries to the User Group Description worksheet.

2. Update your diagram of applications, libraries, and user groups to show the new relationship between the user group and application.

3. If the group's initial library list should include the libraries, change the group's job description by using the Change Job Description (CHGJOBD) command. See "Creating a job description" if you need help for working with job descriptions.

   Note: When you add libraries to the initial library list in a job description, you do not need to change the user profiles that use the job description. When the user signs on next, their initial library list automatically adds those libraries.

4. Evaluate whether you need to change either the initial program or the initial menu for the group to provide access to the new application. You need to make an individual change to the initial menu or program of each user profile by using the CHGUSRPRF command.

5. Review the Library Description forms for all the libraries that are used by the application. Determine whether the public access that is available for the libraries is sufficient for the group's needs. If it is not, you may need to give the group authority to the library, to specific objects, or to authorization lists. Use the Edit Object Authority (EDTOBJAUT) and the Edit Authorization List (EDTAUTL) commands to do this.

Changing a user profile

Job description changes, company policy updates, and personnel changes are some of the reasons that a user profiles will need to be changed.

When a system user gets a new job or a new set of responsibilities in your company, you need to evaluate how that affects the user profile.

1. Should the user belong to a different user group? You can use the **CHGUSRPRF** command to change the user profile.

2. Do you need to change any customizing values in the profile, such as the printer or the initial menu? You can use the **CHGUSRPRF** command to change these also.

3. Are the application authorities of the new user group sufficient for this person?

   • Use the Display User Profile (**DSPUSRPRF**) command to look at the authorities for the old and new group profiles.

   • Also look at the authorities of the individual user profile.

   • Make any changes necessary by using the **EDTOBJAUT** command.

4. Does the user own any objects? Should you change ownership of those objects? Use the Work with Objects by Owner (**WRKOBJOWN**) command.

5. Does the user perform system functions? Does the user need to perform system functions for the new job? Update the System Responsibilities worksheet and change the user profile, if necessary.

Related concepts
User profiles

Every system user must have a user identity before they can sign on to and use a system. This user identity is called a *user profile*.

Disabling user profiles automatically

If someone is gone from the organization for an extended period, it is good a security policy disable their user profile during their absence.

You can use the Analyze Profile Activity (**ANZPRFACT**) command to regularly disable user profiles that have been inactive for a specified number of days. When you use the **ANZPRFACT** command, you specify the number of inactive days that the system looks for. The system looks at the last used date, the restore date, and the creation date for the user profile.

Once you have specified a value for the **ANZPRFACT** command, the system schedules a job to run weekly at 1 a.m. starting with the day after you first specified a value. The job examines all profiles and disables inactive profiles. You do not need to use the **ANZPRFACT** command again unless you want to change the number of inactive days.

You can use the Change Active Profile List (**CHGACTPRFL**) command to make some profiles exempt from **ANZPRFACT** processing. The **CHGACTPRFL** command creates a list of user profiles that the **ANZPRFACT** command will not disable, no matter how long those profiles have been inactive.

When the system runs the **ANZPRFACT** command, it writes a CP entry in the audit journal for each user profile that is disabled. You can use the **DSPAUDJRNE** command to list the user profiles that are newly disabled.

Remember: The system writes audit entries only if the QAUDCTL value specifies *AUDLVL and the QAUDLVL system value specifies *SECURITY.

Another method for checking to ensure that user profiles are being disabled on your planned schedule is to use the Print User Profile (**PRTUSRPRF**) command. When you specify *PWDINFO for the report type, the report includes the status of each selected user profile.

Enabling a disabled user profile

Sometimes a valid user has difficulty getting onto the system and the user ID becomes locked. The profile needs to be re-enabled before the user can access the system.

If the QMAXSIGN and QMAXSGNACN system values on your system are set up to disable a user profile after too many sign-on attempts, you might need to enable the profile by changing the profile status to *ENABLED. To enable a user profile, you must have *SECADM special authority, *OBJMGT authority, and *USE authority to the user profile. Normally, a system operator does not have *SECADM special authority.

A solution is to use a simple program which adopts authority. To create such program, follow these steps:

1. Create a CL program owned by a user who has *SECADM special authority, *OBJMGT authority, and *USE authority to the user profiles on the system. Adopt the authority of the owner when the program is created by specifying USRPRF(*OWNER).

   The main part of the program looks like this:

   ```
   PGM &PROFILE
   DCL VAR(&PROFILE) TYPE(*CHAR) LEN(10)
   CHGUSRPRF USRPRF(&PROFILE) STATUS(*ENABLED)
   ENDPGM
   ```

2. Use the **EDTOBJAUT** command to make the public authority to the program *EXCLUDE and give the system operators *USE authority.

With the program, the operator can enable a profile by entering CALL ENABLEPGM *profile-name*

Related concepts

User profiles

Every system user must have a user identity before they can sign on to and use a system. This user identity is called a *user profile*.

Related information

Listing user profiles

Renaming a user profile

When people change jobs or a new person is hired, an existing profile cannot be directly renamed, but one can be copied and adapted as needed.

The system does not provide a direct method for renaming a user profile.

A new profile can be created with the same authorities for a user with a new name. Some information, however, cannot be transferred to the new profile. The following are examples of information that cannot be transferred:

- Spool files.
- Internal objects containing user preferences and other information about the user will be lost.
- Digital certificates that contain the user name will be invalidated.
- The uid and gid information retained by the integrated file system cannot be changed.
- You might not be able to change the information that is stored by applications that contain the user name.

Applications that are run by the user can have application profiles. Creating a new IBM i user profile to rename a user does not rename any application profiles that the user might have. A Lotus®Notes® profile is one example of an application profile.

The following example shows how to create a new profile for a user with a new name and the same authorities. The old profile name is SMITHM, while the new user profile name is JONESM:

1. Copy the old profile (SMITHM) to a new profile (JONESM) using the copy option from the Work with User Enrollment display.
2. Give JONESM all the private authorities of SMITHM using the Grant User Authority (**GRTUSRAUT**) command:

   ```
   GRTUSRAUT JONESM REFUSER(SMITHM)
   ```

3. Change the primary group of all objects that SMITHM is the primary group of using the Work with Objects by Primary Group (**WRKOBJPGP**) command:

   ```
   WRKOBJPGP PGP(SMITHM)
   ```

   Enter option 9 on all objects that need their primary group changed and enter NEWPGP (JONESM) on the command line.

   Note: JONESM must have a gid assigned using the GID parameter on the Create or Change User Profile (**CRTUSRPRF** or **CHGUSRPRF**) command.

4. Display the SMITHM user profile using the Display User Profile (**DSPUSRPRF**) command:

   ```
   DSPUSRPRF USRPRF(SMITHM)
   ```

   Write down the uid and gid for SMITHM.

5. Transfer ownership of all other owned objects to JONESM and remove the SMITHM user profile, using option 4 (Remove) from the Work with User Enrollment display.
6. Change the uid and the gid of JONESM to the uid and gid that belonged to SMITHM by using the Change User Profile (**CHGUSRPRF**) command:

   ```
   CHGUSRPRF USRPRF(JONESM) UID(uid from SMITHM)          GID(gid from SMITHM)
   ```

If JONESM owns objects in a directory, the **CHGUSRPRF** command cannot be used to change the uid and gid. Use the QSYCHGID API to change the uid and gid of user profile JONESM.

Scheduling availability of user profiles

You may want some user profiles to be available for sign-on only at certain times of the day or certain days of the week.

For example, if you have a profile set up for a security auditor, you may want to enable that user profile only during the hours that the auditor is scheduled to work. You might also want to disable user profiles with *ALLOBJ special authority, including the QSECOFR user profile, during off-hours.

You can use the Change Activation Schedule Entry (**CHGACTSCDE**) command to set up user profiles to be enabled and disabled automatically. For each user profile that you want to schedule, you create an entry that defines the user profile's schedule.

For example, if you want the QSECOFR profile to be available only between 7 in the morning and 10 in the evening, on the CHGACTSCDE display type:

Figure 7. Schedule profile activation display—sample

```
        Change Activation Scd Entry (CHGACTSCDE)

Type choices, press Enter.

User profile . . . . . . . . . > QSECOFR        Name
Enable time  . . . . . . . . . > '7:00'         Time, *NONE
Disable time . . . . . . . . . > '22:00'        Time, *NONE
Days . . . . . . . . . . . . . > *MON           *ALL, *MON, *TUE, *WED...
                               > *TUE
                               > *WED
                               > *THU
              + for more values > *FRI
```

In fact, you might want to have the QSECOFR profile available only for a very limited number of hours each day. You can use another user profile with the *SECOFR class to perform most system functions. Thus, you avoid exposing a well-known user profile to hacking attempts.

You can use the Display Audit Journal Entries (**DSPAUDJRNE**) command periodically to print the CP (Change Profile) audit journal entries. Use these entries to verify that the system is enabling and disabling user profiles according to your planned schedule.

Another method for checking to ensure that user profiles are being disabled on your planned schedule is to use the Print User Profile (**PRTUSRPRF**) command. When you specify *PWDINFO for the report type, the report includes the status of each selected user profile. If, for example, you regularly disable all user profiles with *ALLOBJ special authority, you can schedule the following command to run immediately after the profiles are disabled: PRTUSRPRF TYPE(*PWDINFO) SELECT(*SPCAUT) SPCAUT(*ALLOBJ)

Removing a user from the system

When a user leaves the company, you need to remove the related user profile immediately to prevent the user from having further access to your system.

Before you can delete a user profile, you must either delete or transfer ownership of any objects that are owned by the profile. You can use the **WRKOBJOWN** command to do this, or you can use option 4 (Remove) from the Work with User Enrollment display. When you select option 4 (Remove) for a profile from the Work with User Enrollment display, you see additional displays that allow you to handle any objects the user owns. You can choose to give all the objects to a new owner or handle the objects individually:

```
            Remove User

User . . . . . . . . . . . : HOGANR
User description . . . . . : Sales and Marketing Department

To remove this user type a choice below, then press Enter.

1. Give all objects owned by this user to a new owner
2. Delete or change owner of specific objects owned by this user.
```

If you choose to handle the objects individually (option **2**), the screen displays a list of all the objects that are owned by the user:

```
            Remove User

User . . . . . . . . . . . : HOGANR
User description . . . . . : Sales and Marketing Department

New owner . . . . . . . . . Name, F4 for list

To remove this user, delete or change owner of all objects. Type options below and press Enter.
  2=Change to new owner  4=Delete  5=Display details

Opt  Object  Library  Description
 4   HOGANR  QUSRSYS  Hogan, Richard message queue
 4   QUERY1  DPTWH    Inventory Query
```

If you choose to delete objects, you see the Confirm Delete display. Once the system deletes the objects, you can remove the user profile. You then see the Work with User Enrollment display again with a message that tells you that the system has removed the user.

Related information

Deleting user profiles

Removing user profiles automatically

Your system should contain only user profiles that are necessary. An unnecessary user profile may provide unauthorized entry to your system. If you no longer need a user profile because the user either has left or has taken a different job within the organization, remove the user profile.

You can use the Change User Profile (**CHGUSRPRF**) or the Change Expiration Schedule Entry (**CHGEXPSCDE**) command to manage the disabling of user profiles. The CHGEXPSCDE command also allows the removing of user profiles. If you know that a user is leaving for an extended period, you can schedule the user profile to be removed or disabled.

The first time that you use the **CHGEXPSCDE** command or the **CHGUSRPRF** command specifying the user expiration date or user expiration interval parameter, a job schedule entry is created that runs at 1 minute after midnight every day. The job will determine whether any user profiles are scheduled to be disabled or removed that day.

With the **CHGEXPSCDE** command, you can delete a user profile. If you choose to delete a user profile, you must specify what the system will do with the objects that the user owns. Before you schedule a user profile for deletion, you need to research the objects that the user owns. For example, if the user owns programs that adopt authority, do you want those programs to adopt the ownership of the new owner? Or does the new owner have more authority than necessary, such as special authority? Perhaps, you need to create a new user profile with specific authorities to own the programs that need to adopt authority.

You also need to research whether any application problems will occur if you delete the user profile. For example, do any job descriptions specify the user profile as the default user?

You can use the Display Expiration Schedule (**DSPEXPSCD**) command to display the list of profiles that are scheduled to be disabled or removed. You can use the Display Authorized Users (**DSPAUTUSR**) command to list all of the user profiles on your system. Use the Delete User Profile (**DLTUSRPRF**) command to delete outdated profiles.

Security note: You can disable a user profile by setting its status to *DISABLED. When you disable a user profile, you make it unavailable for interactive use. You cannot sign on with or change your job to a disabled user profile. Batch jobs can run under a user profile that is disabled.

Configuring the system to use security tools

When you install IBM i operating system, the security tools are ready to use. The topics that follow provide suggestions for operating procedures with the security tools.

Use security tools securely

When you install IBM i operating system, the objects that are associated with the security tools are secure. To operate the security tools securely, avoid making authority changes to any security tool objects.

Security settings and requirements for security tool objects:

- The security tool programs and commands are in the QSYS product library. The commands and the programs ship with the public authority of *EXCLUDE. Many of the security tool commands create files in the QUSRSYS library. When the system creates these files, the public authority for the files is *EXCLUDE. Files that contain information for producing changed reports have names that begin with QSEC. Files that contain information for managing user profiles have names that begin with QASEC. These files contain confidential information about your system. Therefore, you should not change the public authority to the files.

- The security tools use your normal system setup for directing printed output. These reports contain confidential information about your system. To direct the output to a protected output queue, make appropriate changes to the user profile or job description for users who will be running the security tools.

- Because of their security functions and because they access many objects on the system, the security tool commands require *ALLOBJ special authority. Some of the commands also require *SECADM, *AUDIT, or *IOSYSCFG special authority. To ensure that the commands run successfully, you should sign on as a security officer when you use the security tools. Therefore, you should not need to grant private authority to any security tool commands.

Avoid file conflicts

Many of the security tool report commands create a database file that you can use to print a changed version of the report. *Commands and menus for security commands* tells the file name for each command. You can only run a command from one job at a time. Most of the commands now have checks that enforce this. If you run a command when another job has not yet finished running it, you will receive an error message.

Many print jobs take a long time to complete. You need to be careful to avoid file conflicts when you submit reports to batch or add them to the job scheduler. For example, you might want to print two versions of the PRTUSRPRF report with different selection criteria. If you are submitting reports to batch, you should use a job queue that runs only one job at a time to ensure that the report jobs run sequentially.

If you are using the job scheduler, you need to schedule the two jobs far enough apart that the first version completes before the second job starts.

Related concepts
System security tools

You can use security tools to manage and monitor the security environment on your system.

Saving security tools

You save the security tool programs whenever you run either the Save System (**SAVSYS**) command or an option from the Save menu that runs the **SAVSYS** command.

The security tool files are in the QUSRSYS library. You should already be saving this library as part of your normal operating procedures. The QUSRSYS library contains data for many licensed programs on your system.

Commands and menus for security commands

This section describes the commands and menus for security tools. Examples of how to use the commands are included throughout this information.

Two menus are available for security tools:

- The SECTOOLS (Security Tools) menu to run commands interactively.
- The SECBATCH (Submit or Schedule Security Reports to Batch) menu to run the report commands in batch.

The SECBATCH menu has two parts. The first part of the menu uses the Submit Job (**SBMJOB**) command to submit reports for immediate processing in batch. The second part of the menu uses the Add Job Schedule Entry (**ADDJOBSCDE**) command. You use it to schedule security reports to be run regularly at a specified day and time.

Security Tools menu options

Table 43. Tool commands for user profiles			
Menu option[1]	Command name	Description	Database file used
1	ANZDFTPWD	Use the Analyze Default Passwords command to report on and take action on user profiles that have a password equal to the user profile name.	QASECPWD[2]
2	DSPACTPRFL	Use the Display Active Profile List command to display or print the list of user profiles that are exempt from ANZPRFACT processing.	QASECIDL[2]

Menu option[1]	Command name	Description	Database file used
Table 43. Tool commands for user profiles (continued)			
3	CHGACTPRFL	Use the Change Active Profile List command to add and remove user profiles from the exemption list for the ANZPRFACT command. A user profile that is on the active profile list is permanently active until you remove the profile from the list. The ANZPRFACT command does not disable a profile that is on the active profile list, no matter how long the profile has been inactive.	QASECIDL[2]
4	ANZPRFACT	Use the Analyze Profile Activity command to disable user profiles that have not been used for a specified number of days. After you use the ANZPRFACT command to specify the number of days, the system runs the ANZPRFACT job nightly. You can use the CHGACTPRFL command to exempt user profiles from being disabled.	QASECIDL[2]
5	DSPACTSCD	Use the Display Profile Activation Schedule command to display or print information about the schedule for enabling and disabling specific user profiles. You create the schedule with the CHGACTSCDE command.	QASECACT[2]

Table 43. Tool commands for user profiles (continued)			
Menu option[1]	Command name	Description	Database file used
6	CHGACTSCDE	Use the Change Activation Schedule Entry command to make a user profile available for sign on only at certain times of the day or week. For each user profile that you schedule, the system creates job schedule entries for the enable and disable times.	QASECACT[2]
7	DSPEXPSCD	Use the Display Expiration Schedule command to display or print the list of user profiles that are scheduled to be disabled or removed from the system in the future. You use the CHGEXPSCDE command to set up user profiles to expire.	
8	CHGEXPSCDE	Use the Change Expiration Schedule Entry command to schedule a user profile for removal. You can remove it temporarily (by disabling it) or you can delete it from the system. This command uses a job schedule entry that runs every day at 00:01 (1 minute after midnight). The job looks at the QASECEXP file to determine whether any user profiles are set up to expire on that day. Use the DSPEXPSCD command to display the user profiles that are scheduled to expire.	

Table 43. Tool commands for user profiles (continued)			
Menu option[1]	Command name	Description	Database file used
9	PRTPRFINT	Use the Print Profile Internals command to print a report containing information about the number of entries contained in a user profile. The number of entries determines the size of the user profile.	

Note:

1. Options are from the SECTOOLS menu.

2. This file is in the QUSRSYS library.

Values set by the Configure System Security command

The Configure System Security (**CFGSYSSEC**) command runs a program that is called QSYS/QSECCFGS to activate the system security features by turning on security auditing, changing system values, and modifying system-supplied user profiles. These features can also be customized as required.

Values that are set by the CFGSYSSEC command
  The values set by the **CFGSYSSEC** command table lists the system values that are set when you run the **CFGSYSSEC** command.

Changing the program
  If some of the security settings are not appropriate for your installation, you can create your own version of the program that processes the **CFGSYSSEC** command.

Related concepts

Applying security system values
Security system values are used to control security on your system.

Functions of the Revoke Public Authority command

You can use the Revoke Public Authority (**RVKPUBAUT**) command to set the public authority to *EXCLUDE for a set of commands and programs.

Commands and APIs whose public authority are set by the RVKPUBAUT command

The **RVKPUBAUT** command runs a program that is called QSYS/QSECRVKP. As it is shipped, the QSECRVKP revokes public authority by setting public authority to *EXCLUDE for the commands that are listed in Table 44 on page 156 and the application programming interfaces (APIs) that are listed in Table 45 on page 156. When your system arrives, these commands and APIs have their public authority set to *USE.

The commands and the APIs that are listed in the tables all perform functions on your system that may provide an opportunity for mischief. As security administrator, you should explicitly authorize users to run these commands and programs rather than make them available to all system users.

When you run the **RVKPUBAUT** command, you specify the library that contains the commands. The default is the QSYS library. If you have more than one national language on your system, you need to run the command for each QSYSxxx library.

Table 44. Setting public authority

Using the **RVKPUBAUT** command		
ADDAJE	CHGJOBQE	RMVCMNE
ADDCFGLE	CHGPJE	RMVJOBQE
ADDCMNE	CHGRTGE	RMVPJE
ADDJOBQE	CHGSBSD	RMVRTGE
ADDPJE	CHGWSE	RMVWSE
ADDRTGE	CPYCFGL	RSTLIB
ADDWSE	CRTCFGL	RSTOBJ
CHGAJE	CRTCTLAPPC	RSTS36F
CHGCFGL	CRTDEVAPPC	RSTS36FLR
CHGCFGLE	CRTSBSD	RSTS36LIBM
CHGCMNE	ENDRMTSPT	STRRMTSPT
CHGCTLAPPC	RMVAJE	STRSBS
CHGDEVAPPC	RMVCFGLE	WRKCFGL

Table 45. Setting public authority

Using the **RVKPUBAUT** command
QTIENDSUP
QTISTRSUP
QWTCTLTR
QWTSETTR
QY2FTML

When you run the **RVKPUBAUT** command, the system sets the public authority for the root directory to *USE, unless it is already *USE or less.

Using security exit programs

Some system functions provide an exit so that your system can run a user-created program to perform additional checking and validation. For example, you can set up your system to run an exit program every time that someone attempts to open a distributed data management (DDM) file on your system.

Sources of sample exit programs

You can use the registration function to specify exit programs that run under certain conditions. The Sources of sample exit programs table provides a list of these exit programs and sources for example programs.

Table 46. Sources of Sample Exit Programs		
Type of exit programs	**Purpose**	**Where to find examples**
Password validation	The QPWDVLDPGM system value can specify a program name or indicate that validation programs registered for the QIBM_QSY_VLD_PASSWRD exit point be used to check a new password for additional requirements that are not handled by the QPWDxxx system values. The use of this program should be carefully monitored because it receives unencrypted passwords. This program should not store passwords in a file or pass them to another program.	• An Implementation Guide for iSeries Security and Auditing, GG24–4200 • Security reference
PC Support/400 or Client Access access	You can specify this program name in the Client request access (PCSACC) parameter of the network attributes to control: • Virtual printer function • File transfer function or Shared folders Type 2 function • Client access message function • Data queues • Remote SQL function	An Implementation Guide for iSeries Security and Auditing, GG24–4200
Distributed Data Management (DDM) access	You can specify this program name in the DDM request access (DDMACC) parameter of the network attributes to control the following functions: • Shared folders Type 0 and 1 function • Submit Remote Command function	An Implementation Guide for iSeries Security and Auditing, GG24–4200
Remote sign on	You can specify a program in the QRMTSIGN system value to control what users can be automatically signed on from which locations (pass-through.)	An Implementation Guide for iSeries Security and Auditing, GG24–4200

Table 46. Sources of Sample Exit Programs (continued)

Type of exit programs	Purpose	Where to find examples
Open Database Connectivity (ODBC) with IBM i Access. See IBM i Access ODBC.	Control these functions of ODBC: • Whether ODBC is allowed at all. • What functions are allowed for IBM i database files. • What SQL statements are allowed. • What information can be retrieved about database server objects. • What SQL catalog functions are allowed.	None available
QSYSMSG break handling program	You can create a program to monitor the QSYSMSG message queue and take appropriate action (such as notifying the security administrator) depending on the type of message.	An Implementation Guide for iSeries Security and Auditing, GG24–4200
TCP/IP	Several TCP/IP servers (such as FTP, TFTP, TELNET, and REXEC) provide exit points. You can add exit programs to handle log-on and to validate user requests, such as requests to get or put a specific file. You can also use these exits to provide anonymous FTP on your system.	TCP/IP User Exits in the Application programming interfaces topic collections.
User profile changes	You can create exit programs for these user profile commands: CHGUSRPRF CRTUSRPRF DLTUSRPRF RSTUSRPRF	• Security reference • TCP/IP User Exits in the Application programming interfaces topic collections.

Managing service tools user ID

You can manage service tool user IDs by using dedicated service tools (DST) , system service tools (SST), and IBM Navigator for i.

Service tools are used to configure, manage, and service your system. Service tools can be accessed from DST or SST. Service tools user IDs are required to access DST and SST, and to use IBM Navigator for i functions for disk unit management. DST is available when the Licensed Internal Code has been started, even if IBM i operating system has not been loaded. SST is available from the IBM i platform.

The following table outlines the basic differences between DST and SST.

Characteristic	DST	SST
How to access	Physical access through console during a manual IPL or by selecting option 21 on the control panel	Access through interactive job with the ability to sign on with QSRV or these authorizations: • Authorized to STRSST (Start SST) CL command • Service special authority (*SERVICE) or all object special authority (*ALLOBJ) • Functional privilege to use SST
When available	Available even when the server has limited capabilities. IBM i operating system is not required to access DST	Available when IBM i operating system has been started. IBM i operating system is required to access SST
How to authenticate	Requires service tools user ID and password	Requires service tools user ID and password

See the **IBM i Information Center** > **Security** > **Service tools** for information about using the Service tools to perform the following tasks:

- Access service tools with DST
- Access service tools with SST
- Access service tools with IBM Navigator for i
- Change service tools user IDs and passwords using SST or DST
- Change the functional privileges for a service tools user ID using DST
- Change the description for a service tools user ID using DST
- Change your service tools user IDs and password using STRSST or QSYCHGDS API
- Configure the service tools server for DST
- Configure the service tools server for IBM i
- Create a service tools user ID using DST
- Delete a service tools user ID using DST
- Disable a service tools user using DST
- Display a service tools user ID using DST
- Enable a service tools user using DST
- Monitor service function use through DST
- Monitor service tools use through IBM i security audit log
- Reset or recover the QSECOFR user profile password
- Reset the QSECOFR service tools user ID and password
- Save and restore service tools security data

Protecting against computer viruses

Your security policies must be designed to protect your system from computer viruses and malicious programs.

Recent trends in computer usage have increased the likelihood that your system has programs from untrusted sources or programs that perform unknown functions:

- A personal computer (PC) user sometimes obtains programs from other PC users. If the PC is attached to your system, that program can affect your server.

- Users who connect to networks can also obtain dangerous programs, from bulletin boards, for example.
- Hackers have become more creative, active, and renowned. They often publish their methods and their results. This recognition can lead to imitation by normally law-abiding programmers.

A **computer virus** is a program that can perform other operations that can take up system resources or destroy data. Additionally, the virus can change other programs to include a copy of itself. The other programs are then said to be infected by the virus. The newly infected programs will continue to spread the virus and its negative effects.

The architecture of the server provides some protection from the infectious characteristics of viruses. A server security administrator needs to be more concerned about programs that perform unauthorized functions. There are many ways that someone with ill intentions might set up harmful programs to run on your system. The topics provide tips for preventing programs from performing unauthorized functions.

Tip: Object authority is always your first line of defense. If you do not have a good plan for protecting your objects, your system is defenseless. This information discusses ways that an authorized user might try to take advantage of loopholes in your object authority scheme.

A computer that has a virus infection has a program that can change other programs. The object-based architecture of this system makes it more difficult for a mischief-maker to produce and spread this type of virus than it is with other computer architectures. On this system, you use specific commands and instructions to work on each type of object. You cannot use a file instruction, which is what most virus-creators do, to change an operable program object. Nor can you easily create a program that changes another program object. To do this requires considerable time, effort, and expertise, as it requires access to tools and documentation that are not generally available.

However, as new server functions become available to participate in the open-systems environment, some of the object-based protection functions of servers no longer apply. For example, with the integrated file system, users can directly manipulate some objects in directories, such as stream files.

Also, although server architecture makes it difficult for a virus to spread among server programs, its architecture does not prevent the system from being a virus-carrier. As a file server, the server can store programs that many PC users share. Any one of these programs might contain a virus that the server does not detect. To prevent this type of virus from infecting the PCs that are attached to your server, you must use PC virus-scan software. Several functions exist on the server to prevent someone from using a low-level language with pointer capability to alter an operable object program:

- If your system runs at security level 40 or higher, the integrity protection includes protections against changing program objects. For example, you cannot successfully run a program that contains blocked (protected) machine instructions.
- The program validation value is also intended to protect you when you restore a program that was saved, and potentially changed, on another system. The *Security level 40* topic in Security reference describes the integrity protection functions for security level 40 and higher, including program validation values.

Note: The program validation value is not foolproof, and it is not a replacement for vigilance in evaluating programs that are restored to your system. Since hackers and other malicious users are able to quickly catch up with advances in technology, the only effective security policies are those that are constantly updated.

Several tools are also available to help you detect the introduction of an altered program into your system:

- You can use the Check Object Integrity (**CHKOBJITG**) command to scan objects that meet your search values to ensure that those objects have not been altered. This is similar to a virus-scan function. You can also use the **CHKOBJITG** command to request that a scan be done of the integrated file system objects. If a user has an application or business partner that scans for viruses using the integrated file system's scan related exit programs, this will trigger a scan for viruses.
- You can use the security auditing function to monitor programs that are changed or restored. The *PGMFAIL, *SAVRST, and *SECURITY values for the authority level system value provide audit records that can help you detect attempts to introduce a virus-type program into your system. The *Auditing security on IBM i* and *Layout of audit journal entries* topics in Security reference provide more information about audit values and the audit journal entries.

- You can use the force create (FRCCRT) parameter of the Change Program (CHGPGM) command to re-create any program that has been restored to your system. The system uses the program template to re-create the program. If the program object has been changed after it was compiled, the system re-creates the changed object and replaces it. If the program template contains blocked (protected) instructions, the system will not re-create the program successfully.
- You can use the QFRCCVNRST (force conversion on restore) system value to re-create any program as it restored to your system. The system uses the program template to re-create the program. QFRCCVNRST provides several choices on which programs to re-create.
- You can use the QVFYOBJRST (verify objects on restore) system value to prevent the restore of programs that do not have a digital signature or do not have a valid digital signature. When a digital signature is not valid, it means the program has been changed since it was signed by its developer. APIs exist that allow you to sign your own programs, save files, and stream files

Related information

Security level 40
Auditing security on IBM i
Layout of audit journal entries

Checking for objects that do not have public authority of *EXCLUDE

The Print Publicly Authorized Objects (**PRTPUBAUT**) command allows you to print a report of the specified objects that do not have public authority of *EXCLUDE. This is a way to check for objects that every user on the system is authorized to access.

For *PGM objects, only the programs that do not have public authority of *EXCLUDE that a user can call will be included in the report. The program is either user domain or the system security level (QSECURITY) is 30 or below.

This command will print two reports. The Full Report will contain all of the specified objects that do not have public authority of *EXCLUDE. The Changed Report will contain the objects that now do not have public authority of *EXCLUDE that did have public authority of *EXCLUDE or did not exist when the PRTPUBAUT command was previously run. If the PRTPUBAUT command was not previously run for the specified objects and library, folder, or directory, there will be no Changed Report. If the command has been previously run, but no additional objects do not have public authority of *EXCLUDE, then the Changed Report will be printed but there will be no objects listed.

Restriction: You must have *ALLOBJ special authority to use this command.

Examples: This command creates the full, and changed reports for all the file objects in the library GARRY that do not have a public authority of *EXCLUDE:

```
PRTPUBAUT OBJTYPE(*FILE) LIB(GARRY)
```

This command creates the full, changed, and deleted reports for all the stream file objects in the subdirectory structure that starts at the directory garry that do not have a public authority of *EXCLUDE:

```
PRTPUBAUT OBJTYPE(*STMF) DIR(GARRY) SCHSUBDIR(*YES)
```

Checking for different sources of authority to objects

The Print Private Authorities (**PRTPVTAUT**) command allows you to print a report of all the private authorities for objects of a specified type in a specified library, folder, or directory. The report lists all objects of the specified type and the users that are authorized to the object. This is a way to check for different sources of authority to objects.

The **PRTPVTAUT** command prints three reports for the selected objects. The Full Report contains all of the private authorities for each of the selected objects. The Changed Report contains additions and changes to the private authorities to the selected objects if the **PRTPVTAUT** command was previously run for the specified objects in the specified library, folder, or directory. Any new objects of the selected type, new authorities to existing objects, or changes to existing authorities to the existing objects are listed

in the Changed Report. If the **PRTPVTAUT** command was not previously run for the specified objects in the specified library, folder, or directory, there will be no Changed Report. If the command has been previously run but no changes have been made to the authorities on the objects, then the Changed Report is printed but there are no objects listed.

The Deleted Report contains any deletions of privately authorized users from the specified objects since the **PRTPVTAUT** command was previously run. Any objects that were deleted or any users that were removed as privately authorized users are listed in the Deleted Report. If the **PRTPVTAUT** command was not previously run, there will be no Deleted Report. If the command has been previously run but no delete operations have been done to the objects, then the Deleted Report is printed but there are no objects listed.

Restriction: You must have *ALLOBJ special authority to use this command.

Examples: Create the full, changed, and deleted reports for all file objects in the PAYROLLLIB:

```
PRTPVTAUT OBJTYPE(*FILE) LIB(PAYROLLLIB)
```

Create the full, changed, and deleted reports for all the stream file objects in the directory `garry`:

```
PRTPVTAUT OBJTYPE(*STMF) DIR(/GARRY) SCHSUBDIR(*NO)
```

Create the full, changed, and deleted reports for all the stream file objects in the subdirectory structure that starts at the directory `garry`:

```
PRTPVTAUT OBJTYPE(*STMF) DIR(/GARRY) SCHSUBDIR(*YES)
```

Print user profile reports

- The Print User Profile (**PRTUSRPRF**) command allows you to print a report containing information for the user profiles on the system. Four different reports can be printed. One contains authority type information, one contains environment type information, one contains password type information, and one contains password level type information.

- The Analyze Default Password (**ANZDFTPWD**) command allows you to print a report of all the user profiles on the system that have a default password and to take an action against the profiles. A profile has a default password when the user profile name matches the profile's password. User profiles on the system that have a default password can be disabled and their passwords can be set to expired.

Checking the settings for security-related system values and network attributes

The Print System Security Attributes (**PRTSYSSECA**) command allows you to print a report of the settings for security-relevant system values and network attributes that are recommended for systems with normal security requirements. It also shows the current settings on your system.

Note: The Current Value column on the report shows the current setting on your system. Compare this value to the recommended value to see where you may have security exposures.

Sample System Security Attributes Report

```
System Security Attributes

System Value
Name            Current Value        Recommended Value
QALWOBJRST    *NONE                  *NONE
QALWUSRDMN    *ALL                   QTEMP
QATNPGM          QEZMAIN QSYS         *NONE
QAUDENDACN    *NOTIFY                *NOTIFY
QAUDFRCLVL    *SYS                   *SYS
QAUDCTL          *AUDLVL                *AUDLVL      *OBJAUD
QAUDLVL          *SECURITY            *AUTFAIL    *CREATE
                                       *DELETE      *SECURITY
                                       *SAVRST      *NOQTEMP

QAUTOCFG      0                      0
QAUTORMT      1                      0
```

```
QAUTOVRT        9999                        0
QCMNRCYLMT     0 0                          0 0
QCRTAUT          *CHANGE                         Control at library level
QCRTOBJAUD     *NONE                    Control at library level
QDEVRCYACN     *DSCMSG                       *DSCMSG
QDSCJOBITV     120                           120
QDSPSGNINF     1                             1
QINACTITV        60                                60
QINACTMSGQ     *ENDJOB                       *ENDJOB
QLMTDEVSSN     0                             1
QLMTSECOFR     0                             1
QMAXSGNACN     2                             3
QMAXSIGN         3                               3

QPWDEXPITV     60                             60
QPWDLMTAJC     1                             1
QPWDLMTCHR     *NONE                         AEIOU@$#
QPWDLMTREP     1                             2
QPWDLVL          0
QPWDMAXLEN     8                             8
QPWDMINLEN     7                             7
QPWDPOSDIF     1                             1
QPWDRQDDGT     1                             1
QPWDRQDDIF     0                             1
QPWDVLDPGM     *NONE                         *NONE
QRETSVRSEC     1                             1
QRMTIPL          0                                 0
QRMTSIGN         *FRCSIGNON                 *FRCSIGNON
QSECURITY        50                               50
QSHRMEMCTL     1                             0
QSRVDMP          *DMPUSRJOB                 *NONE
QUSEADPAUT     *NONE                    CRTAUTL AUTL(QUSEADPAUT) AUT(*EXCLUDE)
                                               CHGOBJOWN OBJ(QUSEADPAUT) OBJTYPE(*AUTL)
                                               CHGSYSVAL SYSVAL(QUSEADPAUT) VALUE(QUSEADPAUT)
QVFYOBJRST     1                             3


Network Attribute
Name           Current Value          Recommended Value
DDMACC         *OBJAUT                    *REJECT
JOBACN         *FILE                      *REJECT
PCSACC         *OBJAUT                    *REJECT
```

Monitoring security

There is more than one technique available for monitoring and auditing security on your system. Consider the information presented here when choosing the best technique or combination of techniques for your system.

In a **security audit**, you need to review and examine the activities of a data processing system to test the adequacy and effectiveness of procedures for data security and data accuracy. The **security audit journal** is the primary source of auditing information on the system. A security auditor inside or outside your organization can use the auditing function provided by the system to gather information about security-related events that occur on the system.

An **intrusion detection** system is software that detects attempts or successful attacks on monitored resources that are part of a network or host system.

Monitoring security regularly has two basic goals:

- Making sure that you protect your company resources adequately
- Detecting unauthorized attempts to access your system and your company's information

Planning security auditing

Use this information to plan security auditing for your systems.

When monitoring your security, the operating system can log security events which occur on your system. These events are recorded in special system objects called journal receivers. You can set up journal receivers to record different types of security events, such as changing a system value or user profile, or an unsuccessful attempt to access an object.

The following values control which events are logged:

- The audit control (QAUDCTL) system value
- The audit level (QAUDLVL) system value
- The audit level (AUDLVL) value in user profiles
- The object auditing (OBJAUD) value in user profiles and objects

The information in the audit journals is used:

- To detect attempted security violations.
- To plan migration to a higher security level.
- To monitor the use of sensitive objects, such as confidential files.

Commands are available to view the information in the audit journals in different ways.

The purpose of an audit is to detect and log activities that might compromise the security of your system. When you choose to log actions that occur on your systems, you might experience a trade-off in performance and, in some cases, loss of disk space.

To plan the use of security auditing on your system:

- Determine which security-relevant events you want to record for all system users. The auditing of security-relevant events is called **action auditing**.
- Check whether you need additional auditing for specific users.
- Decide whether you want to audit the use of specific objects on the system.
- Determine whether object auditing should be used for all users or specific users.

The security audit journal is the primary source of auditing information on the system. A security auditor inside or outside your organization can use the auditing function provided by the system to gather information about security-related events that occur on the system. You use system values, user profile parameters, and object parameters to define auditing.

The security auditing function is optional. You must take specific steps to set up security auditing.

You can define auditing on your system at three different levels:

- System-wide auditing that occurs for all users.
- Auditing that occurs for specific objects.
- Auditing that occurs for specific users.

When a security-related event that may be audited occurs, the system checks whether you have selected that event for audit. If you have, the system writes a journal entry in the current receiver for the security auditing journal (QAUDJRN in library QSYS).

Setting up security auditing
   With security auditing, you can collect information about security events in the QAUDJRN journal.

Using the security audit journal
   The security audit journal is the primary source of auditing information about the system. This section describes how to plan, set up, and manage security auditing, what information is recorded, and how to view that information.

Analyzing object and library authorities
   You can audit the object and library authorities on your system.

Analyzing programs that adopt authority
   Programs that adopt the authority of a user with *ALLOBJ special authority represent a security exposure. You can analyze these programs to audit the security of the system.

Analyzing user profiles
   You can display or print a complete list of all the users on your system by using the Display Authorized Users (**DSPAUTUSR**) command.

Auditing the security officer's actions
   You can keep a record of all actions performed by users with *ALLOBJ and *SECADM special authority for tracking purpose.

Related concepts

Security audits
This topic describes the purpose of security audits.

Related information

Auditing security on IBM i

Checklists for security auditing

Use this checklist to plan and audit system security.

As you plan security, choose the items from the list that meet your security requirements. When you audit the security of your system, use the list to evaluate the controls you have in place and to determine if additional controls are needed. The list contains brief descriptions of how to do each item and how to monitor that it has been done.

Table 47. Security Auditing Planning Form

Security Auditing Planning Form	
Prepared by:	Date:
Monitoring physical security:	
Is backup media protected from damage and theft?	
Is access to workstations in public areas restricted? Use the **DSPOBJAUT** command to see who has *CHANGE authority to the workstations.	
Monitoring system values:	
Verify that the settings for system values match your System Values Selection form. Use the Print System Security Attributes (**PRTSYSSECA**) command.	
Review your decisions about system values, particularly when you install new applications. Have any system values changed?	
Monitoring group profiles:	
Verify that group profiles have no passwords. Use the **DSPAUTUSR** command to verify that all group profiles have a password of *NONE.	
Verify that the correct people are members of the group. Use the **DSPUSRPRF** command with the *GRPMBR option to list the members of a group.	
Check the special authorities for each group profile. Use the **DSPUSRPRF** command. If you are running at security level 30, 40, or 50, group profiles should not have *ALLOBJ authority.	
Monitoring user profiles:	
Verify that user profiles on the system belong to one of these categories: • User profiles for current employees • Group profiles • Application owner profiles • IBM-supplied profiles (start with Q)	

Table 47. Security Auditing Planning Form (continued)

Security Auditing Planning Form	
Remove their user profile when the company transfers a user or when a user leaves the company. Use the Change Expiration Schedule Entry (**CHGEXPSCDE**) command to automatically delete or disable the profile as soon as the user leaves.	
Look for inactive profiles and remove them. Use the Analyze Profile Activity (**ANZPRFACT**) command to automatically disable profiles after they have been inactive for a certain time.	
Determine which users have a password that is the same as their user profile name. Use the Analyze Default Passwords (**ANZDFTPWD**) command. Use the option of this command to force users to change their passwords the next time they sign on to the system. ⚠️ **Attention:** Do not remove any IBM-supplied profiles from the system. IBM-supplied profiles start with the character Q.	
Be aware of who has a user class other than *USER and why. Use the Print User Profile (**PRTUSRPRF**) command to get a list of all users, their user class, and their special authorities. Match this information with your System Responsibilities form.	
Control which user profiles have the Limit capabilities field set to *NO.	
Monitoring critical objects:	
Review who has access to critical objects. Use the Print Private Authorities (**PRTPVTAUT**) command and the Print Publicly Authorized Objects (**PRTPUBAUT**) command to monitor objects. If a group has access, verify the members of the group with the *GRPMBR option of the DSPUSRPRF command.	
Verify who can use application programs that provide access to objects through another security method, such as adopted authority. Use the Print Adopting Objects (**PRTADPOBJ**) command.	
Monitoring unauthorized access:	
Instruct system operators to be alert for security messages in the QSYSOPR message queue. In particular, have them notify a security officer of repeated unsuccessful attempts to sign on. Security messages are in the range of 2200 to 22FF and 4A00 to 4AFF. They have prefixes CPF, CPI, CPC, and CPD.	
Set up security auditing to log unauthorized attempts to access objects.	

Related information

Auditing security on IBM i

Preventing and detecting security exposures

The following information is a collection of tips to help you detect potential security exposures.

Monitoring and keeping your security policy current is a continuous process. You system has several ways to help automate the monitoring process for you.

Related information
Checking for objects that have been altered

Evaluating registered exit programs

You can use the system registration function to register exit programs that should be run when certain events occur. To list the registration information about your system, type WRKREGINF OUTPUT(*PRINT).

For each exit point on the system, the report shows whether any exit programs are currently registered. When an exit point has programs that are currently registered, you can select option 8 (Display programs) from the display version of WRKREGINF to display information about the programs. Use the same method for evaluating these exit programs that you use for other exit programs and trigger programs.

Checking scheduled programs

Since jobs can be scheduled to run in advance, it is a good idea to periodically ensure that all scheduled programs are legitimate. Before leaving the company, an employee can schedule a job that will harm your system to run some time in the future.

The server provides several methods for scheduling jobs to run at a later time, including the job scheduler. Normally, these methods do not represent a security exposure because the user who schedules the job must have the same authority that is required to submit the job to batch. However, you should periodically check for jobs scheduled in the future. A disgruntled user who is no longer in the organization might use this method to schedule a disaster.

Checking for user objects in protected libraries

Use object authority to control who can add programs to protected libraries. User objects other than programs can represent a security exposure when they are in system libraries.

Every server job has a library list. The library list determines the sequence in which the system searches for an object if a library name is not specified with the object name. For example, when you call a program without specifying where the program is, the system searches your library list in order and runs the first copy of the program that it finds.

The *Security Reference* provides more information about the security exposures of library lists and calling programs without a library name, called an unqualified call. It also provides suggestions for controlling the content of library lists and the ability to change the system library lists.

For your system to run properly, certain system libraries, such as QSYS and QGPL, must be in the library list for every job. You should use object authority to control who can add programs to these libraries. Controlling object authorities helps to prevent someone from placing an imposter program in one of these libraries with the same name as a program that appears in a library later in the library list.

You should also evaluate who has authority to the **CHGSYSLIBL** command and monitor SV records in the security audit journal. A devious user can place a library ahead of QSYS in the library list and cause other users to run unauthorized commands with the same names as IBM-supplied commands.

Use the SECBATCH menu option 28 (to submit immediately) or 67 (to use the job scheduler) to run the Print User Objects (**PRTUSROBJ**) command. The **PRTUSROBJ** command prints a list of user objects, objects not created by IBM, that are in a specified library. You can then evaluate the programs on the list to determine who created them and what function they perform.

User objects other than programs can also represent a security exposure when they are in system libraries. For example, if a program writes confidential data to a file whose name is not qualified, that program might be fooled into opening an imposter version of that file in a system library.

Limiting the use of adopted authority

When a program runs, the program can use adopted authority to gain access to objects. Be careful when allowing programs to adopt authority as it may grant permissions you do not want all the program's users to have.

- The program itself can adopt the authority of its owner. This is specified in the user profile (USRPRF) parameter of the program or service program.
- The program can inherit and then use adopted authority from a previous program that is still in the job's call stack. A program can inherit the adopted authority from previous programs even if the program itself does not adopt authority. The use adopted authority (USEADPAUT) parameter of a program or a service program controls whether the program inherits adopted authority from previous programs in the call stack.

Monitoring abnormal deletions

The Print Private Authorities (**PRTPVTAUT**) command allows you to print a report of all the private authorities for objects of a specified type in a specified library, folder, or directory.

The report lists all objects of the specified type and the users that are authorized to the object. You need to check for different sources of authority to objects. The command prints three reports for the selected objects. The Full Report contains all of the private authorities for each of the selected objects. The Changed Report contains additions and changes to the private authorities to the selected objects if the **PRTPVTAUT** command was previously run for the specified objects in the specified library, folder, or directory. Any new objects of the selected type, new authorities to existing objects, or changes to existing authorities to the existing objects are listed in the Changed Report. If the **PRTPVTAUT** command was not previously run for the specified objects in the specified library, folder, or directory, there will be no Changed Report. If the command has been previously run but no changes have been made to the authorities on the objects, then the Changed Report is printed but there are no objects listed.

The Deleted Report contains any deletions of privately authorized users from the specified objects since the **PRTPVTAUT** command was previously run. Any objects that were deleted or any users that were removed as privately authorized users are listed in the Deleted Report. If the **PRTPVTAUT** command was not previously run, there will be no Deleted Report. If the command has been previously run but no delete operations have been done to the objects, then the Deleted Report is printed but there are no objects listed.

Important: You must have *ALLOBJ special authority to use **PRTPVTAUT** command.

Monitoring abnormal system use and access attempts

You need to monitor your system in order to watch for abnormal use and attempts to access the system. Abnormal use and access attempts will be logged on the server and will warn you of possible attacks against your system.

The proxy server can also log all URL requests for tracking purposes. You can then review the logs to monitor use and misuse of network resources.

Monitoring user profiles and authorities

Prevent or restrict users from installing their own programs. No program should be installed on the system without the approval of the security administrator.

When users on your system have unnecessary special authorities, your efforts to develop a good object-authority security scheme may be wasted. Object authority is meaningless when a user profile has *ALLOBJ special authority. A user with *SPLCTL special authority can see any spooled file on the system, no matter what efforts you make to secure your output queues. A user with *JOBCTL special authority can affect system operations and redirect jobs. A user with *SERVICE special authority may be able to use service tools to access data without going through the operating system.

You can use the Print User Profile (**PRTUSRPRF**) command to print information about the special authorities and user classes for user profiles on your system. When you run the report, you have several options:

- All user profiles
- User profiles with specific special authorities
- User profiles that have specific user classes
- User profiles with a mismatch between user class and special authorities.

You can run these reports regularly to help you monitor the administration of user profiles.

Monitoring the use of trigger programs

A trigger program is code that causes something to be done automatically once a given event occurs. Trigger programs are a productive way both to provide application functions and to manage information. Trigger programs are also a way for malicious users to damage your system.

IBM DB2 provides the capability to associate trigger programs with database files. Trigger-program capability is common across the industry for high-function database managers.

When you associate a trigger program with a database file, you specify when the trigger program runs. For example, you can set up the customer order file to run a trigger program whenever a new record is added to the file. When the customer's outstanding balance exceeds the credit limit, the trigger program can print a warning letter to the customer and send a message to the credit manager.

Trigger programs also provide the ability for someone with devious intentions to create a "Trojan horse" on your system. A destructive program may be sitting and waiting to run when a certain event occurs in a database file on your system.

Note: In history, the Trojan horse was a large hollow wooden horse that was filled with Greek soldiers. After the horse was introduced within the walls of Troy, the soldiers climbed out of the horse and fought the Trojans. In the computer world, a program that hides destructive functions is often called a Trojan horse.

When your system ships, the ability to add a trigger program to a database file is restricted. If you are managing object authority carefully, the typical user will not have sufficient authority to add a trigger program to a database file. (Appendix D in the Security Reference book tells the authority that is required or all commands, including the Add Physical File Trigger (**ADDPFTRG**) command.

You can use the Print Trigger Programs (**PRTTRGPGM**) command to print a list of all the trigger programs in a specific library or in all libraries.

You can use the initial report as a base to evaluate any trigger programs that already exist on your system. Then, you can print the changed report regularly to see whether new trigger programs have been added to your system.

When you evaluate trigger programs, consider:

- *Who created the trigger program?* You can use the Display Object Description (**DSPOBJD**) command to determine who created the trigger program.
- *What does the program do?* You must look at the source program or talk to the program creator to determine what functionality the trigger program has. For example, does the trigger program check to see who the user is? Perhaps the trigger program is waiting for a particular user (QSECOFR) in order to gain access to system resources.

After you have established a base of information, print the changed report regularly to monitor new trigger programs that have been added to your system.

Preventing new programs from using adopted authority

The passing of adopted authority to programs located later in the stack provides an opportunity for a knowledgeable programmer to create a Trojan horse program.

The Trojan horse program can rely on previous programs in the stack to get the authority that it needs to perform mischief. To prevent this, you can limit which users are allowed to create programs that use the adopted authority of previous programs.

When you create a new program, the system automatically sets the USEADPAUT parameter to *YES. If you do not want the program to inherit adopted authority, you must use the Change Program (**CHGPGM**) command or the Change Service Program (CHGSRVPGM) to set the USEADPAUT parameter to *NO.

You can use an authorization list and the use adopted authority (QUSEADPAUT) system value to control who can create programs that inherit adopted authority. When you specify an authorization list name in the QUSEADPAUT system value, the system uses this authorization list to determine how to create new programs.

When a user creates a program or service program, the system checks the user's authority to the authorization list. If the user has *USE authority, the USEADPAUT parameter for the new program is set to *YES. If the user does not have *USE authority, the USEADPAUT parameter is set to *NO. The user's authority to the authorization list cannot come from adopted authority.

The authorization list that you specify in the QUSEADPAUT system value also controls whether a user can use a CHGxxx command to set the USEADPAUT value for a program or a service program.

Note:

- You do not need to call your authorization list QUESADPAUT. You can create an authority list with a different name. Then specify that authorization list for the QUSEADPAUT system value. In the commands in this example, substitute the name of your authorization list.
- The QUSEADPAUT system value does not affect existing programs on your system. Use the **CGHPGM** command or the **CHGSRVPGM** command to set the USEADPAUT parameter for existing programs.

In a more restrictive environment, if you want most users to create new programs with the USEADPAUT parameter set to *NO:

1. To set the public authority for the authorization list to *EXCLUDE, type: CHGAUTLE
   AUTL(QUSEADPAUT) USER(*PUBLIC) AUT(*EXCLUDE)

2. To set up specific users to create programs that use the adopted authority of previous programs, type:
   ADDAUTLE AUTL(QUSEADPAUT) USER(user-name) AUT(*USE)

In a Less Restrictive Environment: If you want most users to create new programs with the USEADPAUT parameter set to *YES, do the following steps:

1. Leave the public authority for the authorization list set to *USE

2. To prevent specific users from creating programs that use the adopted authority of previous programs, type: ADDAUTLE AUTL(QUSEADPAUT) USER(user-name) AUT(*EXCLUDE)

Using digital signatures to protect software integrity

Using digital signatures gives you greater control over which software can be loaded onto your system and allows you more power to detect changes once it has been loaded.

All of the security precautions you take are meaningless if someone can bypass them by introducing tampered data into your system. The server has many built-in features which you can use to keep tampered software from being loaded onto your system, and to detect any such software already there. One of the techniques is **object signing**.

Object signing is the implementation of a cryptographic concept known as **digital signatures**. The idea is relatively straightforward: once a software producer is ready to ship software to customers, the producer "signs" the software. This signature does not guarantee that the software performs any specific function. However, it provides a way to prove that the software came from the producer who signed it, and that the software has not changed since it was produced and signed. This proof of authenticity is particularly

important if the software has been transmitted across the Internet or stored on media which you feel might have been modified.

The new system value, Verify Object Restore (QVFYOBJRST), provides a mechanism for setting a restrictive policy which requires all software loaded onto the system to be signed by known software sources. You can also choose a more open policy and just verify signatures if they are present.

All IBM i software, as well as the software for options and licensed programs, has been signed by a system trusted source. These signatures help the system protect its integrity, and they are checked when fixes are applied to the system to ensure that the fix has come from a system trusted source and that it did not change in transit. These signatures can also be checked once the software is on the system. The Check Object Integrity (**CHKOBJITG**) command checks signatures of the objects on the system. Additionally, the Digital Certificate Manager has panels that you can use to check signatures on objects, including objects in the operating system.

Just as the operating system has been signed, you can use digital signatures to protect the integrity of software which is critical to your business. You might buy software which has been signed by a software provider, or you might sign software which you have purchased or written. Part of your security policy, then, might be to periodically use **CHKOBJITG**, or the Digital Certificate Manager, to verify that the signatures on that software are still valid and that the objects have not changed since they were signed. You can also require that all software which gets restored on your system be signed by you or a known source. However, since most server software which is not produced by IBM is not currently signed so this method might be too restrictive for your system. The digital signature function gives you the flexibility to decide how best to protect your software integrity.

Modifying architected transaction program names

Architecture TPNs are a normal way for communications to function and do not necessarily represent a security exposure. However, architecture TPNs might provide an unexpected entrance into your system. Learn the techniques used to prevent architected transaction program names from running on the system.

Some communications requests send a specific type of signal to your system. This request is called an **architecture transaction program name** (TPN) because the name of the transaction program is part of the APPC architecture for the system. A request for display station pass-through is an example of an architecture TPN.

Some TPNs do not pass a profile on the request. If the request becomes associated with a communications entry whose default user is *SYS, the request may be initiated on your system. However, the *SYS profile can run system functions only, not user applications.

If you do not want architecture TPNs to run with a default profile, you can change the default user from *SYS to *NONE in communications entries.

If you do not want a specific TPN to run on your system at all, perform these steps:

1. Create a CL program that accepts several parameters. The program should perform no function. It should have the Declare (DCL) statements for parameters and then end.
2. Add a routing entry for the TPN to each subsystem that has communications entries or remote location name entries. The routing entry should specify:
   - A Compare value (CMPVAL) value equal to the program name for the TPN with a starting position of 37.
   - A Program to call (PGM) value equal to the name of the program that you created in step . This prevents the TPN from locating another routing entry, such as *ANY.

Architecture TPN requests
This topic lists the architecture transaction program names and their associated user profiles.

Table 48. Programs and users for architecture TPN requests

TPN request	Program	User profile	Description
X'30F0F8F1'	AMQCRC6A	*NONE	Message queuing

TPN request	Program	User profile	Description
Table 48. Programs and users for architecture TPN requests (continued)			
X'06F3F0F1'	QACSOTP	QUSER	APPC sign-on transaction program
X'30F0F2D1'	QANRTP	QADSM	ADSM/400 APPC configuration
X'30F0F1F9'	QCNPCSUP	*NONE	Shared folders
X'07F0F0F1'	QCNTEDDM	QUSER	DDM
X'07F6C4C2'	QCNTEDDM	QUSER	Remote SQL-DRDA1
X'30F0F7F7'	QCQNRBAS	QSVCCS	SNA CC_Server
X'30F0F1F4'	QDXPRCV	QUSER	DSNX–PC receiver
X'30F0F1F3'	QDXPSEND	QUSER	DSNX–PC sender
X'30F0F2C4'	QEVYMAIN	QUSER	ENVY**/400 Server
X'30F0F6F0'	QHQTRGT	*NONE	PC data queue
X'30F0F8F0'	QLZPSERV	*NONE	Client Access license manager
X'30F0F1F7'	QMFRCVR	*NONE	PC message receiver
X'30F0F1F8'	QMFSNDR	*NONE	PC message sender
X'30F0F6F6'	QND5MAIN	QUSER	APPN 5394 workstation controller
DB2DRDA	QCNTEDDDM	QUSER	DB2DRDA
APINGD	QNMAPINGD	QUSER	APINGD
X'30F0F5F4'	QNMEVK	QUSER	Systems management utilities
X'30F0F2C1'	QNPSERVR	*NONE	PWS-I network print server
X'30F0F7F9'	QOCEVOKE	*NONE	Cross-system calendar
X'30F0F6F1'	QOKCSUP	QDOC	Directory shadowing
X'20F0F0F7'	QOQSERV	QUSER	DIA Version 2
X'20F0F0F8'	QOQSERV	QUSER	DIA Version 2
X'30F0F5F1'	QOQSERV	QUSER	DIA Version 2
X'20F0F0F0'	QOSAPPC	QUSER	DIA Version 1
X'30F0F0F5'	QPAPAST2	QUSER	S/36—S/38 pass-through
X'30F0F0F9'	QPAPAST2	QUSER	Printer pass-through
X'30F0F4F6'	QPWFSTP0	*NONE	Shared folders type 2
X'30F0F2C8'	QPWFSTP1	*NONE	Client access file server
X30F0F2C9''	QPWFSTP2	*NONE	Windows client access file server
X'30F0F6F9'	QRQSRVX	*NONE	Remote SQL-converged server
X'30F0F6F5'	QRQSRV0	*NONE	Remote SQL without commit
X'30F0F6F4'	QRQSRV1	*NONE	Remote SQL without commit

Table 48. Programs and users for architecture TPN requests (continued)			
TPN request	**Program**	**User profile**	**Description**
X'30F0F2D2'	QSVRCI	QUSER	SOC/CT
X'21F0F0F8'	QS2RCVR	QGATE	SNADS FS2 receiver
X'21F0F0F7'	QS2STSND	QGATE	SNADS FS2 sender
X'30F0F1F6'	QTFDWNLD	*NONE	PC transfer function
X'30F0F2F4'	QT1HNPCS	QUSER	TIE function
X'30F0F1F5'	QVPPRINT	*NONE	PC virtual print
X'30F0F2D3'	QWGMTP	QWGM	Ultimedia Mail/400 server
X'30F0F8F3'	QZDAINIT	QUSER	PWS-I data access server
X'21F0F0F2'	QZDRCVR	QSNADS	SNADS receiver
X'21F0F0F1'	QZDSTSND	QSNADS	SNADS sender
X'30F0F2C5'	QZHQTRG	*NONE	PWS-I data queue server
X'30F0F2C6'	QZRCSRVR	*NONE	PWS-I remote command server
X30F0F2C7''	QZSCSRVR	*NONE	PWS-I central server

Monitoring access to output and job queues

This topic describes how to monitor access to output and job queues, explains why it is important, and provides step-by-step instructions.

Sometimes a security administrator does a great job of protecting access to files and then forgets about what happens when the contents of a file are printed. Servers provide functions for you to protect sensitive output queues and job queues. You protect an output queue so that unauthorized users cannot, for example, view or copy confidential spooled files that are waiting to print. You protect job queues so that an unauthorized user cannot either redirect a confidential job to a nonconfidential output queue or cancel the job entirely.

You can use the following SECBATCH menu options to print the security settings for the job queues and output queues on your system: 24 to submit the job immediately and 63 to use the job scheduler. You also can use the Print Queue Authority (**PRTQAUT**) command to print the security settings for the job queues and output queues on your system. You can then evaluate printing jobs that print confidential information and ensure that they are going to output queues and job queues that are protected.

For output queues and job queues that you consider to be security-sensitive, you can compare your security settings with the required output queue and job queue function settings in the Job queue commands and Output queue commands tables.

Related information

Print Queue Authority (PRTQAUT)
Job queue commands
Output queue commands

Monitoring subsystem descriptions

A subsystem description defines what that environment looks like. Subsystem descriptions, therefore, can provide an opportunity for devious users. You need to regularly review the subsystem descriptions that exist on your system.

When you start a subsystem on a server, the system creates an environment for work to enter the system and run. A mischief-maker might use a subsystem description to start a program automatically or to make it possible to sign on without a user profile.

When you run the Revoke Public Authority (**RVKPUBAUT**) command, the system sets public authority to subsystem description commands to *EXCLUDE. This prevents users who are not specifically authorized and who do not have *ALLOBJ special authority, from changing or creating subsystem descriptions.

You can use the Work with Subsystem Descriptions (**WRKSBSD**) command to create a list of all the subsystem descriptions. When you select **5** (Display) from the list, a menu displays for the system description that you selected. It shows a list of the parts of a subsystem environment.

You select options to see details about the parts. Use the Change Subsystem Description (**CHGSBSD**) command to change the first two items on the menu. To change other items, use the appropriate add, remove, or change command for the entry type. For example, to change a workstation entry, use the Change Workstation Entry (**CHGWSE**) command.

For additional information about working with subsystem descriptions, including lists of the shipped values for IBM-supplied subsystem descriptions, refer to the topic: Work Management.

Reviewing autostart job entries

Look at your autostart job entries and the associated job descriptions. Ensure that you understand the function of any program that runs automatically when a subsystem starts.

An autostart job entry contains the name of a job description. The job description may contain request data (RQSDTA) that causes a program or a command to run. For example, the RQSDTA might be CALL LIB1/PROGRAM1. Whenever the subsystem starts, the system will run the program PROGRAM1 in library LIB1.

Reviewing workstation names and types

Look at your workstation entries and the associated job descriptions. Ensure that no one has added or updated any entries to run programs that you are not aware of.

When a subsystem starts, it allocates all not allocated workstations that are listed (specifically or generically) in its entries for workstation names and workstations types. When a user signs on, the user is signing on to the subsystem that has allocated the workstation.

The workstation entry tells what job description will be used when a job starts at that workstation. The job description may contain request data that causes a program or a command to run. For example, the RQSDTA parameter might be CALL LIB1/PROGRAM1. Whenever a user signs on to a workstation in that subsystem, the system will run PROGRAM1 in LIB1.

A workstation entry might also specify a default user profile. For certain subsystem configurations, this allows someone to sign on just by pressing the **Enter** key. If the security level (QSECURITY system value) on your system is less than 40, you should review your workstation entries for default users.

Reviewing job queue entries

You should periodically review the job queue entries in your subsystem descriptions to ensure that batch jobs are running where you expect them to run.

When a subsystem starts, it allocates any not allocated job queues that are listed in the subsystem description. Job queue entries do not provide any direct security exposure. However, they do provide an opportunity for someone to tamper with system performance by causing jobs to run in unintended environments.

Reviewing routing entries

Look at the routing entries and ensure that no one has added or updated any entries to run programs that you are not aware of.

A routing entry defines what a job does once it enters the subsystem. The subsystem uses routing entries for all job types: batch, interactive, and communications jobs. A routing entry specifies:

- The class for the job. Like job queue entries, the class that is associated with a job can affect its performance but does not represent a security exposure.

• The program that runs when the job starts.

Reviewing communications entries and remote location names

Ensure that the communications entries are secure.

When a communications job enters your system, the system uses the communications entries and the remote location name entries in the active subsystem to determine how the communications job will run. Look at this information in these entries:

• All subsystems are capable of running communications jobs. If a subsystem that you intend for communications is not active, a job that is trying to enter your system might find an entry in another subsystem description that meets its needs. You need to look at the entries in all subsystem descriptions.

• A communications entry contains a job description. The job description may contain request data that runs a command or program. Look at your communications entries and their associated job descriptions to ensure that you understand how jobs will start.

• A communications entry also specifies a default user profile that the system uses in some situations. Make sure that you understand the role of default profiles. If your system contains default profiles, you should ensure that they are profiles with minimal authority.

You can use the Print Subsystem Description (**PRTSBSDAUT**) command to identify communications entries that specify a user profile name.

For additional information about the permissions assigned to default user profiles, see: Target system assignment of user profiles for jobs.

Reviewing prestart job entries

Prestart jobs may start when the subsystem starts or when they are needed. You need to make sure that prestart job entries perform only authorized, intended functions.

You can use prestart job entries to make a subsystem ready for certain kinds of jobs so that the jobs start more quickly. Prestart job entries provide the potential for security exposures.

A prestart job entry specifies:

• A program to run
• A default user profile
• A job description

Reviewing job descriptions

You should periodically review job descriptions to make sure that they do not run unintended programs. Use object authority to prevent changes to job descriptions.

Job descriptions contain request data and routing data that can cause a specific program to run when that job description is used. When the job description specifies a program in the request data parameter, the system runs the program. When the job description specifies routing data, the system runs the program that is specified in the routing entry that matches the routing data.

The system uses job descriptions for both interactive and batch jobs. For interactive jobs, the workstation entry specifies the job description. Typically, the workstation entry value is *USRPRF, so the system uses the job description that is specified in the user profile. For batch jobs, you specify the job description when you submit the job.

Job descriptions can also specify what user profile the job should run under. With security level 40 and higher, you must have *USE authority to the job description and to the user profile that is specified in the job description. With security levels lower than 40, you need *USE authority only to the job description.

You should use object authority to prevent changes to job descriptions. *USE authority is sufficient to run a job with a job description. A typical user does not need *CHANGE authority to job descriptions.

Finally, ensure that the default values for the Submit Job (**SBMJOB**) command and the Create User Profile (**CRTUSRPRF**) command have not been changed to point to unintended job descriptions.

Using the PRTJOBDAUT command

Use the Print Job Description Authority (**PRTJOBDAUT**) command to print a list of job descriptions that specify user profiles and have public authority of *USE. In the SECBATCH menu, specify either option **15** (to submit immediately) or option **54** to use the job scheduler to issue the **PRTJOBDAUT** command.

The report from the **PRTJOBDAUT** command shows the special authorities of the user profile that is specified in the job description. The report includes the special authorities of any group profiles that the user profile has.

You can use the following command to display the user profile's private authorities: DSPUSRPRF USRPRF(*profile-name*) TYPE(*OBJAUT)

The job description specifies the library list that the job uses when it runs. If someone can change a user's library list, that user might run an unintended version of a program in a different library. You should periodically review the library lists that are specified in the job descriptions on your system.

Monitoring authority

You need to constantly monitor the effectiveness of the security safeguards on your system.

A set of security reports are available to help you keep track of how the authority is set up on your system. When you run these reports initially, you can print everything, authority for all the files or for all the programs, for example.

After you have established your base of information, you can run the changed versions of reports regularly. The changed versions help you identify security-relevant changes on your system that require your attention. For example, you can run the report that shows the public authority for files every week. You can request only the changed version of the report. It will show you both new files on the system that are available to everyone and existing files whose public authority has changed since the last report.

Two menus are available to run security tools:

- Use the SECTOOLS menu for running programs interactively.
- Use the SECBATCH menu for running programs in batch. The SECBATCH menu has two parts: one for submitting jobs to the job queue immediately, and the other for placing jobs on the job scheduler.

Review your security policy statement and your security memo to users as you decide which monitoring tasks you need to perform regularly.

Monitoring authorization lists

Use authorization lists to organize object groups based on security requirements. Monitor authorization lists to be sure the lists remain current to system and user needs.

You can group objects with similar security requirements by using an authorization list. An authorization list contains a list of users and the authority that the users have to the objects that are secured by the list. Authorization lists provide an efficient way to manage the authority to similar objects on the system. However, in some cases, they make it difficult to keep track of authorities to objects. You can use the Print Private Authority (**PRTPVTAUT**) command to print information about authorities in an authorization list. The Private Authorities Report for Authorization Lists figure shows a sample report.

```
               Private Authorities (Full Report)

SYSTEM4
Authorization  Primary                     List -------Object--------- ----------Data----------
List   Owner   Group  User     Authority Mgt Opr Mgt Exist Alter Ref Read Add Upd Dlt Execute
LIST1  QSECOFR *NONE  *PUBLIC  *EXCLUDE
LIST2  BUDNIKR *NONE  BUDNIKR  *ALL       X   X   X   X     X     X   X    X   X   X   X
                      *PUBLIC  *CHANGE    X   X   X   X     X         X
LIST3  QSECOFR *NONE  *PUBLIC  *EXCLUDE
LIST4  CJWLDR  *NONE  CJWLDR   *ALL       X   X   X   X     X     X   X    X   X   X   X
                      GROUP1   *ALL       X   X   X   X     X         X    X   X   X
                      *PUBLIC  *EXCLUDE
```

Figure 8. Private Authorities Report for Authorization Lists

This report shows the same information that you see on the Edit Authorization List (EDTAUTL) display. The advantage of the report is that it provides information about all authorization lists in one place. If you are setting up security for a new group of objects, for example, you can quickly scan the report to see if an existing authorization list meets your needs for those objects.

You can print a changed version of the report to see new authorization lists or authorization lists with authority changes since you last printed the report. You also have the option of printing a list of the objects that are secured by each authorization list. The Report for Displaying Authorization List Objects figure shows an example of the report for one authorization list.

```
                    Display Authorization List Objects

Authorization list . . . . . . : CUSTAUTL
Library  . . . . . . . . . . . : QSYS
Owner  . . . . . . . . . . . . : AROWNER
Primary group  . . . . . . . . : *NONE

                                    Primary
Object    Library   Type    Owner   Group    Text
CUSTMAS   CUSTLIB   *FILE   AROWNER *NONE
CUSTORD   CUSTORD   *FILE   OEOWNER *NONE
```

Figure 9. Report for Displaying Authorization List Objects

You can use this report, for example, to understand the effect of adding a new user to an authorization list, based on what authorities that user will receive.

Monitoring private authority to objects

SECBATCH menu options and security commands that you can use to monitor private authority to objects.

Private authority is the authority specifically given to a user for an object that overrides any other authorities, such as the authority of a user's group profile or an authorization list. Users who are not listed in the group profile or authorization list cannot access objects with private authority.

You can use SECBATCH menu options to monitor private authority to objects: 12 to submit immediately and 14 to use the job scheduler. The SECBATCH menu contains options for the object types that are typically of concern to security administrators. Use the general options (19 and 58) to specify the object type.

In addition, you can use the Print Private Authority (**PRTPVTAUT**) command to print a list of all the private authorities for objects of a specified type in a specified library. The private authority report can help you detect new authorities to objects. It can also help you keep your private authority scheme from becoming complicated and unmanageable.

Monitoring public authority to objects

Public authority is the authority for an object granted to all users. SECBATCH menu options and security commands can be used to monitor public authority to objects.

For both simplicity and performance, most systems are set up so that most objects are available to most users. Users are explicitly denied access to certain confidential, security-sensitive objects rather than having to be explicitly authorized to use every object. A few systems with high security requirements take the opposite approach and authorize objects on a need-to-know basis. On those systems, most objects are created with the public authority set to *EXCLUDE.

Your system is object-based with many different types of objects. Most object types do not contain sensitive information or perform security-relevant functions. As a security administrator on a system with typical security needs, you probably want to focus your attention on objects that require protection, such as database files and programs. For other object types, you can just set public authority that is sufficient for your applications, which for most object types is *USE authority.

You can use the Print Public Authority (**PRTPUBAUT**) command to print information about objects that public users can access. A public user is anyone with signon authority who does not have explicit authority to an object. When you use the PRTPUBAUT command, you can specify the object types, and libraries or directories, that you want to examine.

You can use options 11 or 50 on the SECBATCH menu to print the Publicly Authorized Objects report for the object types that might have security implications. Use the general options (18 and 57) to specify the object type. You can print the changed version of this report regularly to see what objects might require your attention.

For more information, see: Monitoring special authorities.

Monitoring user environments

The SECBATCH menu and commands can be used to monitor user environments. A user's environment affects how the user sees the system and, to some extent, what the user is allowed to do.

One role of the user profile is to define the environment for the user, including the output queue, the initial menu, and the job description. The user must have authority to the objects that are specified in the user profile. However, if your authority scheme is still in progress or is not very restrictive, the user environment that is defined in a user profile may produce results that you do not intend.

Use the following SECBATCH menu options to monitor user environments: 29 to submit the job immediately and 68 to use the job schedule.

There are some items to watch for when monitoring user environments:

- The user's job description may specify a user profile that has more authority than the user.
- The user may have an initial menu that does not have a command line. However, the user's attention-key-handling program may provide a command line.
- The user may be authorized to run confidential reports. However, the user's output may be directed to an output queue that is available to users who should not see the reports.

You can use the *ENVINFO option of the Print User Profile (**PRTUSRPRF**) command to help you monitor the environments that are defined for system users. An example of the report:

```
                  User Profile Information
Report type . . . . . . . . . . : *ENVINFO
Select by . . . . . . . . . . . : *USRCLS
                    Initial Initial  Job          Message Output  Attention
User       Current  Menu/   Program/ Description/ Queue/  Queue/  Program/
Profile    Library  Library Library  Library      Library Library Library
AUDSECOFR  AUDITOR  MAIN    *NONE    QDFTJOBD     QSYSOPR *WRKSTN *SYSVAL
                    *LIBL            QGPL         QSYS
USERA      *CRTDFT  OEMENU  *NONE    QDFTJOBD     USERA   *WRKSTN *SYSVAL
                    *LIBL            QGPL         QUSRSYS
USERB      *CRTDFT  INVMENU *NONE    QDFTJOBD     USERB   *WRKSTN *SYSVAL
                    *LIBL            QGPL         QUSRSYS
USERC      *CRTDFT  PAYROLL *NONE    QDFTJOBD     USERC   PAYROLL *SYSVAL
                    *LIBL            QGPL         QUSRSYS PRPGMLIB
```

Figure 10. Print User Profile: User Environment Report

For more information, see: Monitoring security messages.

Monitoring special authorities

Special authority is a type of authority a user can have to perform system functions, including all object authority, save system authority, job control authority, security administrator authority, spool control authority, service authority, and system configuration authority. SECBATCH menu options and commands are used to monitor special authorities.

When users on your system have unnecessary special authorities, your efforts to develop a good object-authority scheme may be wasted. Object authority is meaningless when a user profile has *ALLOBJ special authority. A user with *SPLCTL special authority can see any spooled file on the system, no matter what efforts you make to secure your output queues. A user with *JOBCTL special authority can affect system operations and redirect jobs. A user with *SERVICE special authority may be able to use service tools to access data without going through the operating system.

Use the following SECBATCH menu options to monitor special authorities: 29 to submit the job immediately or 68 to use the job scheduler.

You can use the Print User Profile (**PRTUSRPRF**) command to print information about the special authorities and user classes for user profiles on your system. When you run the report, you have several options:

• All user profiles
• User profiles with specific special authorities
• User profiles that have specific user classes
• User profiles with a mismatch between user class and special authorities.

An example of the report that shows the special authorities for all user profiles:

```
                  User Profile Information
Report type . . . . . . . . . . : *AUTINFO
Select by . . . . . . . . . . . : *SPCAUT
Special authorities . . . . . . : *ALL
            ------------Special Authorities------------
                    *IO                                        Group
User    Group    *ALL *AUD SYS *JOB *SAV *SEC *SER *SPL User            Group     Authority Limited
Profile Profiles OBJ  IT   CFG CTL  SYS  ADM  VICE CTL  Class   Owner   Authority Type      Capability
USERA   *NONE    X    X    X   X    X    X    X    X    *SECOFR *USRPRF *NONE     *PRIVATE  *NO
USERB   *NONE              X   X                        *PGMR   *USRPRF *NONE     *PRIVATE  *NO
USERC   *NONE    X    X    X   X    X    X    X    X    *SECOFR *USRPRF *NONE     *PRIVATE  *NO
USERD   *NONE                                          *USER   *USRPRF *NONE     *PRIVATE  *NO
```

Figure 11. User Information Report: Example 1

In addition to the special authorities, the report shows:

• Whether the user profile has limited capability.
• Whether the user or the user's group owns new objects that the user creates.
• What authority the user's group automatically receives to new objects that the user creates.

The figure User Information Report: Example 2 is an example of the report for mismatched special authorities and user classes, showing:

- USERX has a system operator (*SYSOPR) user class but has *ALLOBJ and *SPLCTL special authorities.
- USERY has a user (*USER) user class but has *SECADM special authority.
- USERZ also has a user (*USER) class and *SECADM special authority. You can also see that USERZ is a member of the QPGMR group, which has *JOBCTL and *SAVSYS special authorities.

```
                    User Profile Information

Report type . . . . . . . . . : *AUTINFO
Select by . . . . . . . . . . : *MISMATCH
            ------------Special Authorities------------                      Group
                       *IO                                           Group       Authority Limited
User     Group    *ALL *AUD SYS *JOB *SAV *SEC *SER *SPL User             Group      Authority Limited
Profile Profiles OBJ  IT  CFG CTL  SYS  ADM  VICE CTL Class   Owner   Authority Type      Capability
USERX   *NONE    X            X    X              X   *SYSOPR *USRPRF *NONE    *PRIVATE  *NO
USERY   *NONE                           X            *USER   *USRPRF *NONE    *PRIVATE  *NO
USERZ   *NONE                           X            *USER   *USRPRF *NONE    *PRIVATE  *NO
        QPGMR             X    X
```

Figure 12. User Information Report: Example 2

You can run these reports regularly to help you monitor the administration of user profiles.

Related concepts

Special authorities
Several special authorities can be specified for a user. When you create a user profile, you can select special authorities based on the user class.

Monitoring sign-on and password activity

If you are concerned about unauthorized attempts to enter your system, you can use the **PRTUSRPRF** command to help you monitor sign-on and password activity.

Here are several suggestions for using the PRTUSRPRF report:

- Determine whether the password expiration interval for some user profiles is longer than the system value and whether the longer expiration interval is justified. For example, in the report, USERY has a password expiration interval of 120 days.
- Run this report regularly to monitor unsuccessful signon attempts. Someone who is trying to break into your system may be aware that your system takes action after a certain number of unsuccessful attempts. Each night, the intruder might try fewer times than your QMAXSIGN value to avoid alerting you to the attempts. However, if you run this report early each morning and notice that certain profiles often have unsuccessful sign-on attempts, you should suspect that you have a problem.
- Identify user profiles that have not been used for a long time or whose passwords have not been changed for a long time.

Monitoring user profile activity

User profiles provide entry to your system. As a security administrator, you need to control and audit changes that occur to user profiles on your system.

Parameters in the user profile determine a user's environment and a user's security characteristics. You can set up security auditing so that your system writes a record of changes to user profiles. You can use the **DSPAUDJRNE** command to print a report of those changes. You can create exit programs to evaluate requested actions to user profiles.

The Exit points for user profile activity table shows the exit points that are available for user profile commands.

Table 49. Exit points for user profile activity	
User profile command	**Exit point name**
Create User Profile (**CRTUSRPRF**)	QIBM_QSY_CRT_PROFILE
Change User Profile (**CHGUSRPRF**)	QIBM_QSY_CHG_PROFILE
Delete User Profile (**DLTUSRPRF**)	QIBM_QSY_DLT_PROFILE
Restore User Profile (**RSTUSRPRF**)	QIBM_QSY_RST_PROFILE

Your exit program can, for example, look for changes that might cause the user to run an unauthorized version of a program. These changes might be assigning either a different job description or a new current library. Your exit program might either notify a message queue or take some action, like changing or disabling the user profile, based on the information that the exit program receives.

Related information

User profile exit points

Monitoring security messages

Monitoring security messages is an important part of your security duties. Security messages are stored in the QSYSOPR message queue and can be reviewed by a program or system operator.

Some security-relevant events, such as incorrect signon attempts, cause a message in the QSYSOPR message queue. You can also create a separate message queue called QSYSMSG in the QSYS library.

If you create the QSYSMSG message queue in the QSYS library, messages about critical system events are sent to that message queue as well as to QSYSOPR. The QSYSMSG message queue can be monitored separately by a program or a system operator. This provides additional protection of your system resources. Critical system messages in QSYSOPR are sometimes missed because of the volume of messages sent to that message queue.

Preventing loss of auditing information

Steps should be taken to prevent the loss of auditing information.

Two system values control what the system does when error conditions may cause the loss of audit journal entries, which are audit force level (QAUDFRCLVL) and audit end action (QAUDENDACN). Refer to Preventing loss of auditing information in the Security reference topic.

Managing the audit journal and journal receivers

Journal receivers can be managed manually.

If you choose to manage journal receivers manually, use the following procedure to detach, save and delete a journal receiver:

1. Type CHGJRN JRN(QAUDJRN) JRNRCV(*GEN). The command will:

   a. Detach the currently attached receiver

   b. Create a new receiver with the next sequential number

   c. Attach the new receiver to the journal

   For example, if the current receiver is AUDRCV0003, the system creates and attaches a new receiver called AUDRCV0004.

   The Work with Journal Attributes (**WRKJRNA**) command tells you which receiver is currently attached: WRKJRNA QAUDJRN.

2. Use the Save Object (**SAVOBJ**) command to save the detached journal receiver. Specify object type *JRNRCV.

3. Use the Delete Journal Receiver (**DLTJRNRCV**) command to delete the receiver. If you try to delete the receiver without saving it, you receive a warning message.

Saving and deleting audit journal receivers
You need to regularly detach the current audit journal receiver and attach a new one.

Using journals to monitor object activity
If you include the *AUTFAIL value for system action auditing (the QAUDLVL system value), the system writes an audit journal entry for every unsuccessful attempt to access a resource. For critical objects, you can also set up object auditing so the system writes an audit journal entry for each successful access.

Stopping the audit function

You might want to use the audit function periodically rather than all the time. For example, you might want to use it when testing a new application. Or you might use it to perform a quarterly security audit.

For more information about how to stop the auditing function, you can refer to the Stopping the audit function topic in Security reference in the Information Center.

Using the history log

Some authority failure and integrity violation messages are found in the history log.

Not all of the authority failure and integrity violation messages are found in the QHST log. Refer to the Using the history log topic.

Related information for Planning and setting up system security

Listed here are the product manuals and IBM Redbooks (in PDF format), Web sites, and information center topics that relate to the Plan and set up system security topic. You can view or print any of the PDFs.

Manuals

Security reference

Other information

- Intrusion detection describes how to prevent intrusions that come in over the TCP/IP network.

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PDF file for Planning and setting up system security
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