

IBM i
7.4

Security
Single sign-on



Note

Before using this information and the product it supports, read the information in [“Notices” on page 69.](#)

This edition applies to IBM i 7.4 (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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Single sign-on

If you are looking for a way to eliminate the number of passwords that your users must use and that your administrators must manage, then implementing a single sign-on environment might be the answer you need.

This information presents a single sign-on solution for IBM® i, which uses network authentication service (IBM's implementation of the Kerberos V5 standard from MIT) paired with Enterprise Identity Mapping (EIM). The single sign-on solution reduces the number of sign-ons that a user must perform, as well as the number of passwords that a user requires to access multiple applications and servers.

Note: Read the [“Code license and disclaimer information”](#) on page 66 for important legal information.



What's new for IBM i 7.4

Read about new or significantly changed information for the single sign-on 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, the information center uses:

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

In PDF files, you might see revision bars (|) in the left margin of new and changed information.

To find other information about what's new or changed this release, see the [Memo to users](#).

PDF file for Single sign-on

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

To view or download the PDF version of this document, select [Single sign-on](#).

You can view or download these related topics:


- [Enterprise Identity Mapping \(EIM\)](#). Enterprise Identity Mapping (EIM) is a mechanism for mapping a person or entity (such as a service) to the appropriate user identities in various user registries throughout the enterprise.
- [Network authentication service](#). Network authentication service allows your system to participate in an existing Kerberos network.

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Single sign-on concepts

Single sign-on uses multiple services and technologies to achieve a solution that offers simplified identity and authorization management.

The following topics explain the benefits of single sign-on and how different services are used to create this solution. Before you begin using single sign-on, you might find it helpful to review these concepts:

Single sign-on overview

A single sign-on solution is designed to alleviate the use of having multiple user names and passwords across your enterprise. Implementing a single sign-on solution benefits user, administrators, and application developers.

In traditional network environments, a user authenticates to a system or application by providing user credentials defined on and by that system or application. Traditionally, both authentication and authorization mechanisms use the same user registry when a user attempts to access a resource managed by the system or application. In a single sign-on environment, authentication and authorization mechanisms do not have to use the same user registry to enable users to resources managed by the system or application. Single sign-on environments use network authentication service (Kerberos authentication) as their authentication mechanism. In a single sign-on environment, the user registry used for authentication does not have to be the registry that the system or application defines. In a traditional network environment, this poses a problem for authorization.

In an single sign-on network environment, applications use Enterprise Identity Mapping (EIM) to solve this problem. EIM is a mechanism for mapping or associating a person or entity to the appropriate user identities in various registries throughout the enterprise. Application developers for IBM i use EIM to build applications that use one user registry for authentication and another for authorization--without requiring the user to provide another set of credentials. The benefits of a single sign-on environment are numerous, and not just for users. Administrators and application developers can also benefit from the single sign-on solution.

Benefits for users

The single sign-on solution reduces the number of sign-ons that a user must perform to access multiple applications and servers. With single sign-on, authentication occurs only once when users sign into the network. Using EIM reduces the need for users to keep track of and manage multiple user names and passwords to access other systems in the network. After a user is authenticated to the network, the user can access services and applications across the enterprise without the need for multiple passwords to these different systems.

Benefits for administrators

For an administrator, single sign-on simplifies overall security management of an enterprise. Without single sign-on, users might cache passwords to different systems, which can compromise the security of the entire network. Administrators spend their time and money on solutions to diminish these security risks. Single sign-on reduces the administrative overhead in managing authentication while helping to keep the entire network secure. Additionally, single sign-on reduces the administrative costs of resetting forgotten passwords. Administrators can set up a single sign-on environment where a user for a Microsoft Windows operating system can sign-on once and have access to the entire network, thus minimizing authentication and identification management.

Benefits for application developers

For developers of applications that must run in heterogeneous networks, the challenge is to create multi-tiered applications where each tier is likely to be a different type of platform. By exploiting EIM, application developers are free to write applications that use the most appropriate existing user registry for authentication while using a different user registry for authorization. Not having to

implement application specific user registries, associated security semantics, and application level security significantly lowers the cost of implementing multi-tiered, cross-platform applications.

Related concepts

Authentication

Authentication is part of a single sign-on solution because it identifies who a user is and then proves it, typically based on a user name and password.

Authorization

Authorization is a process in which a user is granted access to a network or system resource.

Related information

Enterprise Identity Mapping

Authentication

Authentication is part of a single sign-on solution because it identifies who a user is and then proves it, typically based on a user name and password.

The process of authentication is different from the process of authorization, in which an entity or a person is granted or denied access to a network or system resource.

A single sign-on environment streamlines the process and management of authentication for users and administrators. Because of the way single sign-on is implemented on your system, not only do users need to supply fewer IDs and passwords but, if you choose to, they do not even need to have a IBM i passwords. Administrators need to troubleshoot identity and password problems less often because users need to know fewer identities and passwords to access the systems that they use.

Interfaces that are enabled for single sign-on require the use of Kerberos as the authentication method. Network authentication service is the IBM i implementation of the Kerberos authentication function. Network authentication service provides a distributed authentication mechanism through the use of a Kerberos server, also called a key distribution center (KDC), which creates service tickets that are used to authenticate the user (a **principal** in Kerberos terms) to some service on the network. The ticket provides proof of the principal's identity to other services that the principal requests in the network.

Note: If you are an application developer, it is possible to make use of other types of authentication methods as you enable your applications to work in a single sign-on environment. For example, you can create applications that use an authentication method, such as digital certificates, in conjunction with EIM APIs to enable your application to participate in a single sign-on environment.

Related concepts

Single sign-on overview

A single sign-on solution is designed to alleviate the use of having multiple user names and passwords across your enterprise. Implementing a single sign-on solution benefits user, administrators, and application developers.

Authorization

Authorization is a process in which a user is granted access to a network or system resource.

Related information

Network authentication service

Authorization

Authorization is a process in which a user is granted access to a network or system resource.

Most enterprises use a two-stage process to allow users to access network assets. The first stage of this process is authentication. Authentication is a process in which a user identifies themselves to the enterprise. Typically this requires the user to provide an identifier and a password to the security component of the enterprise. The security component verifies the information that it receives. After a successful authentication, the user is issued a process they can use, a credential, or a ticket to use to demonstrate that they have already authenticated to the enterprise. An example of a user authentication is the ID and password challenge on an IBM i Access Client Solutions 5250 emulator connection. After

successful authentication, the user is assigned a job that runs under their user ID. The second stage is authorization. It is important to know the distinction between authentication and authorization.

Authorization is the process of determining if an entity or person has the authority to access an asset within an enterprise. Authorization checks are done after a user has authenticated to the enterprise, because authorization requires that the enterprise knows who is trying to gain access. Authorization checking is mandatory and occurs as part of the system. Users are typically unaware that authorization checks occur unless their access is denied. An example of authorization occurs when a user uses the command CRTSRCPF QGPL/MYFILE. The system performs authorization checks on the command CRTSRCPF and the library QGPL. If the user does not have the authority to access the command and the library, the user's request fails.

An enterprise that has implemented the IBM i single sign-on solution uses Enterprise Identity Mapping (EIM) to manage user access to enterprise assets. While EIM does not perform authorization checks, the identity mapping establishes the local identities for users that have successfully authenticated into the enterprise. The source (or user) receives access and privileges on the target system through the local ID. For example, assume you have the following simple enterprise environment:

Employee Name (EIM Identity)	Source Users (EIM Source)	Target users for System A (EIM Target)	Employee Responsibility	System A User Comments
Susan Doe	SusanD	SecOfficer	IT Security Officer	All special authority. Has access to all files and information.
Fred Ray	FredR	PrimeAcnt	Lead Accountant	No special authority. Has access to all payroll information.
Nancy Me	NancyM	PrimePGM	IT Application Team Leader	No special authority. Has access to all company application source files.
Brian Fa	BrianF	GenAcnt1	Accountant	No special authority. Has access to some payroll information.
Tracy So	TracyS	ITPgm2	IT Programmer	No special authority. Has access to some company application source files.
Daryl La	DarylL	ITPgm3	IT Programmer	No special authority. Has access to some company application source files.
Sherry Te	SherryT	PrimeMKT	Marketing Representative	No special authority. Has access to all marketing data.

It is important that all of the associations between users and resources are set up correctly. If the associations are incorrect, users will have access to data outside the scope of their responsibilities, which is a security concern for most enterprises. System administrators need to be very careful when creating the EIM mappings and ensure that they map users to the correct local registry IDs. For example if you mapped the IT Programmer, Daryl La, to the SecOfficer ID instead of Susan Doe, you could compromise the security of the system. This reinforces the fact that security administrators must still take care in securing the target systems within the enterprise.

Related concepts

Single sign-on overview

A single sign-on solution is designed to alleviate the use of having multiple user names and passwords across your enterprise. Implementing a single sign-on solution benefits user, administrators, and application developers.

Authentication

Authentication is part of a single sign-on solution because it identifies who a user is and then proves it, typically based on a user name and password.

Related information

[Enterprise Identity Mapping](#)

Domains

EIM and Windows domains are used to implement a single sign-on environment.

Although both the EIM domain and Windows domain contain the word domain, they have very different definitions. Use the following descriptions to understand the differences between these two types of domains.

EIM domain

An EIM domain is a collection of data, which includes the EIM identifiers, EIM associations, and EIM user registry definitions that are defined in that domain. This data is stored in a Lightweight Directory Access Protocol (LDAP) server, such as the IBM Tivoli® Directory Server for IBM i, which can run on any system in the network, defined in that domain. Administrators can configure systems (EIM clients), such as IBM i, to participate in the domain so that systems and applications can use domain data for EIM lookup operations and identity mapping.

Windows domain

In the context of single sign-on, a Windows domain is a Windows network that contains several systems operating as clients and servers and a variety of services and applications used by the systems. The following are some of the components pertinent to single sign-on that you might find within a Windows domain:

Realm

A realm is a collection of machines and services. The main purpose of a realm is to authenticate clients and services. Each realm uses a single Kerberos server to manage the principals for that particular realm.

Kerberos server

A Kerberos server, also known as a key distribution center (KDC), is a network service that resides on the Windows server and provides tickets and temporary session keys for network authentication service. The Kerberos server maintains a database of principals (users and services) and their associated secret keys. It is composed of the authentication server and the ticket granting server. A Kerberos server uses Microsoft Windows Active Directory to store and manage the information in a Kerberos user registry.

Microsoft Windows Active Directory

Microsoft Windows Active Directory is an LDAP server that resides on the Windows server along with the Kerberos server. The Active Directory is used to store and manage the information in a Kerberos user registry. Microsoft Windows Active Directory uses Kerberos authentication as its default security mechanism. Therefore, if you are using Microsoft Active Directory to manage your users, you are already using Kerberos technology.

Related concepts

Identity mapping

Identity mapping is the process of using defined relationships between user identities in an enterprise such that applications and operating systems can map from one user identity to another, related user identity.

Related information

[Enterprise Identity Mapping](#)

[Enterprise Identity Mapping Concepts](#)

Identity mapping

Identity mapping is the process of using defined relationships between user identities in an enterprise such that applications and operating systems can map from one user identity to another, related user identity.

The ability to map between identities is essential to single sign-on enablement, as it allows you to separate the process of authentication from that of authorization. Identity mapping allows a user to log on to a system and be authenticated based on the credentials of one user identity and then be able to access a subsequent system or resource without having to supply new credentials. Instead, the authenticated identity is mapped to the appropriate identity for the requested system or resource. Not only does this make life easier for the user, who need not supply a second credential for logging on to the second system, but the authorizations he has for the second system are handled by the appropriate identity.

To implement single sign-on, you need to create certain EIM data within the EIM domain to define the relationships needed to appropriately map identities within your single sign-on environment. Doing so ensures that EIM can use that data to perform mapping lookup operations for single sign-on. You use EIM to create associations to define the relationships between user identities in your enterprise. You can create both identifier associations and policy associations to define these relationships depending on how you want identity mapping to work.

Identifier associations

Identifier associations allow you to define a one-to-one relationship between user identities through an EIM identifier defined for an individual. Identifier associations allow you to specifically control identity mapping for user identities and are especially useful when individuals have user identities with special authorities and other privileges. These associations dictate how the user identities are mapped from one to another. In a typical identity mapping situation, you create source associations for authenticating user identities and target associations to map the authenticating user identity to the appropriate user identities for authorized access to other systems and resources. For example, you might typically create the following identifier associations between an EIM identifier and corresponding user identities for a user:

- A source association for the user's Kerberos principal, which is the identity with which the user logs into, and is authenticated to, the network.
- Target associations for each user identity in the various user registries that the user accesses, such as IBM i user profiles.

The following example illustrates how the identity mapping process works for identifier associations. The security administrator at Myco, Inc creates an EIM identifier (John Day) for an employee. This EIM identifier uniquely identifies John Day in the enterprise. The administrator then creates identifier associations between the John Day identifier and two user identities that he routinely uses in the enterprise. These associations define how the user identities are mapped. The administrator creates a source association for the Windows identity, which is a Kerberos principal, and a target association for an IBM i user profile. These associations enable his Windows identity to be mapped to his IBM i user profile.

John Day uses the appropriate user name and password to log on to his Windows workstation each morning. After he has logged on, he starts IBM i Access Client Solutions to use his Windows workstation to access the IBM i system using IBM i Access Client Solutions applications. Because single sign-on is enabled, the identity mapping process uses his authenticated Windows identity to find the associated IBM i user profile and transparently authenticates and authorizes him to the IBM i system.

Single sign-on supports selecting from multiple local user identity mappings for the same system, using the IP address of the target system to select the correct local user identity mapping on that system.

Policy associations

Policy associations allow you to define a many-to-one relationship between a group of user identities in one or more user registries and a specific individual target user identity in another user registry. Typically,

you use policy associations to map from a group of users who require the same level of authority for an application to a single user identity with the appropriate authority.

The following example illustrates how identity mapping works when you define policy associations. A number of workers in the Order Receiving Department of Myco, Inc. all need the same type of authorization to access a Web-based application that runs on the Windows server. These users currently have user identities for this purpose in a single user registry named Order_app. The administrator creates a default registry policy association to map all the users in the Order_app user registry to a single Windows identity. This Windows identity, SYSUSER, provides the minimum authority needed for this group of users. Performing this single configuration step allows the administrator to ensure that all users of the Web-based application have the access they need with the proper level of authorization that they need. However, the administrator also benefits because it eliminates the need to create and maintain individual Windows identities for each user.

Related concepts

[Domains](#)

EIM and Windows domains are used to implement a single sign-on environment.

Related information

[EIM identifiers](#)

[EIM registry definitions](#)

[EIM associations](#)

[EIM mapping lookup operations](#)

[EIM domain](#)

IBM i enablement

The IBM i implementation of Enterprise Identity Mapping (EIM) and Kerberos (referred to as network authentication services) provides a true multi-tier single sign-on environment.

The network authentication service is IBM's implementation of Kerberos and the Generic Security Service (GSS) APIs. You can use EIM to define associations that will provide a mapping between a Kerberos principal and an IBM i user profile. You can then use this association to determine which EIM identifier corresponds to a local IBM i user profile or Kerberos principal. This is one of the benefits of enabling single sign-on in IBM i on the server.

IBM i enablement of single sign-on

To enable a single sign-on environment, IBM exploits two technologies that work together: EIM and network authentication service, which is IBM's implementation of Kerberos and the GSS APIs. By configuring these two technologies, an administrator can enable a single sign-on environment. Windows, AIX®, and z/OS® use Kerberos protocol to authenticate users to the network. Kerberos involves the use of a network-based, secure, key distribution center which authenticates principals (Kerberos users) to the network. The fact that a user has authenticated to the KDC is represented by a Kerberos ticket. A ticket can be passed from a user to a service that accepts tickets. The service accepting a ticket uses it to determine who the user claims to be (within the Kerberos user registry and realm) and that they are in fact who they claim to be.

While network authentication service allows a server to participate in a Kerberos realm, EIM provides a mechanism for associating these Kerberos principals to a single EIM identifier that represents that user within the entire enterprise. Other user identities, such as an IBM i user name, can also be associated with this EIM identifier. Based on these associations, EIM provides a mechanism for IBM i and applications to determine which IBM i user profile represents the person or entity represented by the Kerberos principal. You can think of the information in EIM as a tree with an EIM identifier as the root, and the list of user identities associated with the EIM identifier as the branches.

Enabling single sign-on for your server simplifies the task of managing IBM i user profiles and reduces the number of sign-ons that a user must perform to access multiple IBM i applications and servers. Additionally, it reduces the amount of time that is required for password management by each user. Single

sign-on allows each user to remember and use fewer passwords to access applications and servers, thereby simplifying their IBM i experience.

IBM i client and server applications currently enabled for single sign-on

- IBM i Host Servers is currently used by IBM i Access Client Solutions.
- Telnet server: currently used by PC5250 and IBM WebSphere® Host On-Demand Version 8: Web Express Logon feature.
- Telnet client
- Open DataBase Connectivity (ODBC): allows single sign-on access to IBM i databases through ODBC.
- Java™ Database Connectivity (JDBC): allows single sign-on access to IBM i databases through ODBC.
- Distributed Relational Database Architecture™ (DRDA): allows single sign-on access to IBM i databases through ODBC.
- QFileSrv.400
- FTP client and FTP server

ISV enablement

An independent software vendor (ISV) can create applications and programs that can participate in a single sign-on environment.

As an ISV you know that many of your customers are implementing single sign-on environments to take advantage of the cost and time benefits that single sign-on provides. You want to ensure that you design your application products to participate in single sign-on environments so that you can continue to provide the solutions that your customers want and need.

To enable your applications to participate in an IBM i single sign-on environment, you need to perform the following tasks:

Enable your IBM i server applications for EIM

One of the foundations of a single sign-on environment is Enterprise Identity Mapping (EIM). EIM is a mechanism for mapping or associating a person or entity to the appropriate user identities in various registries throughout the enterprise. Application developers for IBM i use EIM to build applications that use one user registry for authentication and another for authorization--without requiring the user to provide another set of credentials. EIM provides APIs for creating and managing these identity mapping relationships, as well as APIs that applications use to query this information. You can write applications that use EIM APIs to perform lookup operations for user identities within an enterprise.

Enable your IBM i server and client applications to use a common authentication mechanism

While you are free to choose any common authentication mechanism you want for your application's single sign-on environment, the IBM i single sign-on environment is based on the network authentication service (Kerberos) which provides an integrated single sign-on environment with Windows domains. If you want your applications to participate with the same secure, integrated single sign-on environment as IBM i, should choose network authentication service as the authentication mechanism for your applications. The following are examples of the different authentication methods you can choose for your applications:

Network authentication service

Use the [Scenario: Enable single sign-on for ISV applications](#) to learn how to use EIM application programming interfaces (APIs) in conjunction with network authentication service to create applications that can fully participate in a single sign-on environment. This scenario includes some [ISV code examples](#), including pseudocode, for example pseudocode and snippets that you can use to help complete your program.

Digital certificates

It is possible to develop applications for a single sign-on environment that use digital certificates as the authentication method. To insert the necessary code into your program for authenticating with digital certificates, you must use the [Digital Certificate Management APIs](#).

Lightweight Directory Access Protocol (LDAP)

It is possible to develop applications for a single sign-on environment that use the directory server as the authentication method. To insert the necessary code into your program for authenticating with the directory server, you must use the [Lightweight Directory Access Protocol \(LDAP\) APIs](#).

Related information

[Enterprise Identity Mapping](#)

[EIM APIs](#)

Scenarios: Single sign-on

These scenarios provide real world examples for planning, configuring, and using single sign-on in an enterprise.

Although all of these scenarios provide models for network administrators, there is also a scenario for application developers that demonstrates the tasks that a developer needs to complete to create applications that can participate in a single sign-on environment.

Scenario: Creating a single sign-on test environment

In this scenario, you want to configure network authentication service and EIM to create a basic single sign-on test environment. Use this scenario to gain a basic understanding of what configuring a single sign-on environment involves on a small scale before implementing single sign-on across an entire enterprise.

Situation

You, John Day, are a network administrator for a large wholesale company. Currently you spend much of your time troubleshooting password and user identity problems, such as forgotten passwords. Your network is comprised of several IBM i systems and a Windows server, where your users are registered in Microsoft Windows Active Directory. Based on your research, you know that Microsoft Active Directory uses the Kerberos protocol to authenticate Windows users. You also know that the IBM i platform provides a single sign-on solution based on an implementation of Kerberos authentication, called network authentication service, in conjunction with EIM.

You are excited about the benefits of using single sign-on. However, you want to thoroughly understand single sign-on configuration and usage before you begin using it across your entire enterprise. Consequently, you decide to configure a test environment first.

After considering the various groups in your company, you decide to create the test environment for the Order Receiving department. The employees in the Order Receiving department use multiple applications on one IBM i system to handle incoming customer orders. Consequently, the Order Receiving department provides an excellent opportunity for you to create a single sign-on test environment that you can use to better understand how single sign-on works and how to plan a single sign-on implementation across your enterprise.

Scenario advantages

- Allows you to see some of the benefits of single sign-on on a small scale to better understand how you can take full advantage of it before you create a large-scale, single sign-on environment.
- Provides you with a better understanding of the planning process you need to use to successfully and to more quickly implement single sign-on across your entire enterprise.
- Minimizes the learning curve of implementing single sign-on across your enterprise.

Objectives

As the network administrator at MyCo, Inc., you want to create a small single sign-on environment for testing that includes a small number of users and a single IBM i. You want to perform thorough testing to ensure that user identities are correctly mapped within your test environment. Based on this configuration, you eventually want to expand the test environment to include the other systems and users in your enterprise.

The objectives of this scenario are as follows:

- The IBM i, known as System A, must be able to use Kerberos within the MYCO.COM realm to authenticate the users and services that are participating in this single sign-on test environment. To enable the system to use Kerberos, System A must be configured for network authentication service.
- The directory server on System A must function as the domain controller for the new EIM domain.
Note: Refer to [“Domains” on page 5](#) to learn how an EIM domain and a Windows domain both fit into the single sign-on environment.
- One user profile on System A and one Kerberos principal must each be mapped to a single EIM identifier.
- A Kerberos service principal must be used to authenticate the user to the IBM i Access Client Solutions applications.

Details

The following figure illustrates the network environment for this scenario.

The figure illustrates the following points relevant to this scenario.

EIM domain data defined for the enterprise

- An EIM registry definition for System A called SYSTEMA.MYCO.COM.
- An EIM registry definition for the Kerberos registry called MYCO.COM.
- An EIM identifier called John Day. This identifier uniquely identifies John Day, the administrator for MyCo.
- A source association for the jday Kerberos principal on the Windows server.
- A target association for the JOHND user profile on System A.

Windows server

- Acts as the Kerberos server (kdc1.myco.com), also known as a key distribution center (KDC), for the network.
- The default realm for the Kerberos server is MYCO.COM.
- A Kerberos principal of jday is registered with the Kerberos server on the Windows server. This principal will be used to create a source association to the EIM identifier, John Day.

System A

- Runs IBM i with the following options and licensed programs installed:
 - IBM i Host Servers (5770-SS1 Option 12)
 - Qshell Interpreter (5770-SS1 Option 30)
- The IBMTivoli Directory Server for IBM i (LDAP) on System A will be configured to be the EIM domain controller for the new EIM domain, MyCoEimDomain.
- System A participates in the EIM domain, MyCoEimDomain.
- The principal name for System A is `k1bsvr400/systema.myco.com@MYCO.COM`.
- The user profile of JOHND exists on System A. You will create a target association between this user profile and the EIM identifier, John Day.
- The home directory for the IBM i user profile, JOHND, (`/home/JOHND`) is defined on System A.

Client PC used for single sign-on administration

- Runs Microsoft Windows operating system.
- Serves as the primary logon system for administrator John Day.
- Configured to be part of the MYCO.COM realm (Windows domain).

Prerequisites and assumptions

Successful implementation of this scenario requires that the following assumptions and prerequisites are met:

1. All system requirements, including software and operating system installation, have been verified.

To verify that the licensed programs have been installed, complete the following:

- a. From IBM Navigator for i, expand **IBM i Management > Configuration and Service > Software**.
 - b. Click **Installed Products**.
 - c. Ensure that all the necessary licensed programs are installed.
2. All necessary hardware planning and setup is complete.
 3. TCP/IP and basic system security are configured and tested on each system.
 4. The directory server and EIM should not be previously configured on System A.

Note: Instructions in this scenario are based on the assumption that the directory server has not been previously configured on System A. However, if you already configured the directory server, you can still use these instructions with only slight differences. These differences are noted in the appropriate places within the configuration steps.

5. A single DNS server is used for host name resolution for the network. Host tables are not used for host name resolution.

Note: The use of host tables with Kerberos authentication might result in name resolution errors or other problems.

Configuration steps

Note: You need to thoroughly understand the concepts related to single sign-on which include network authentication service and Enterprise Identity Mapping (EIM) concepts, before you implement this scenario. If you are ready to continue with this scenario complete the following steps:

Related tasks

Testing your application

You have completed the development of both client and server specific updates to your **Calendar** application, enabling it for an IBM i single sign-on environment. You are now ready to test it.

Configuring single sign-on

To configure a single sign-on environment you must use a compatible authentication method as your authentication method and Enterprise Identity Mapping (EIM) to create and manage your user profiles and identity mappings.

Related information

Host name resolution considerations

Enterprise Identity Mapping (EIM)

Completing the planning work sheets

The following planning work sheets are tailored to fit this scenario based on the general single sign-on planning worksheets.

These planning work sheets demonstrate the information that you need to gather and the decisions you need to make to prepare the single sign-on implementation described by this scenario. To ensure a successful implementation, you must be able to answer Yes to all prerequisite items in the work sheet

and you should gather all the information necessary to complete the work sheets before you perform any configuration tasks.

Note: You need to thoroughly understand the concepts related to single sign-on which include network authentication service and Enterprise Identity Mapping (EIM) concepts, before you implement this scenario.

<i>Table 1. Single sign-on prerequisite work sheet</i>	
Prerequisite work sheet	Answers
Are the following options and licensed programs installed on System A? <ul style="list-style-type: none"> • IBM i Host Servers (5770-SS1 Option 12) • Qshell Interpreter (5770-SS1 Option 30) 	Yes
Have you installed an application that is enabled for single sign-on on each of the PCs that will participate in the single sign-on environment? <p>Note: For this scenario, all of the participating PCs have IBM i Access Client Solutions (5733-XJ1) installed. See IBM i Access Client Solutions: Getting Started</p>	Yes
Do you, the administrator, have *SECADM, *ALLOBJ, and *IOSYSCFG special authorities?	Yes
Do you have one of the following systems acting as the Kerberos server (also known as the KDC)? If yes, specify which system. <ol style="list-style-type: none"> 1. Windows server 2. IBM i PASE 3. AIX server 4. z/OS 	Yes, Windows server
Are all your PCs in your network configured in a Windows domain?	Yes
Have you applied the latest program temporary fixes (PTFs)?	Yes
Is the IBM i time within 5 minutes of the system time on the Kerberos server? If not see Synchronizing system times .	Yes
Are you running IBM i PASE for the Kerberos server?	You must have IBM Network Authentication Enablement for i(5770-NAE) installed.

You need this information to configure EIM and network authentication service to create a single sign-on test environment.

<i>Table 2. Single sign-on configuration planning work sheet for System A</i>	
Configuration planning work sheet for System A	Answers
Use the following information to complete the EIM Configuration wizard. The information in this work sheet correlates with the information you need to supply for each page in the wizard:	

Table 2. Single sign-on configuration planning work sheet for System A (continued)

Configuration planning work sheet for System A	Answers
How do you want to configure EIM for your system? • Join an existing domain • Create and join a new domain	Create and join a new domain
Where do you want to configure your EIM domain?	On the local directory server Note: This will configure the directory server on the same system on which you are currently configuring EIM.
Do you want to configure network authentication service? Note: You must configure network authentication service to configure single sign-on.	Yes
The Network Authentication Service wizard opens from the EIM Configuration wizard. Use the following information to complete the Network Authentication Service wizard: Note: You can launch the Network Authentication Service wizard independently of the EIM Configuration wizard.	
What is the name of the Kerberos default realm to which your IBM i will belong? Note: A Windows domain is similar to a Kerberos realm.	MYCO.COM
Are you using Microsoft Active Directory?	Yes
What is the Kerberos server, also known as a key distribution center (KDC), for this Kerberos default realm? What is the port on which the Kerberos server listens?	KDC: kdc1.myco.com Port: 88 Note: This is the default port for the Kerberos server.
Do you want to configure a password server for this default realm? If yes, answer the following questions: What is name of the password server for this Kerberos server? What is the port on which the password server listens?	Yes Password server: kdc1.myco.com Port: 464 Note: This is the default port for the password server.
For which services do you want to create keytab entries? • IBM i Kerberos Authentication • LDAP • IBM HTTP Server for i • IBM i NetServer • IBM i Network File System (NFS) Server • IBM i Network FTP Server	IBM i Kerberos Authentication

Table 2. Single sign-on configuration planning work sheet for System A (continued)

Configuration planning work sheet for System A	Answers
<p>What is the password for your service principal or principals?</p>	<p>systema123</p> <p>Note: Any and all passwords specified in this scenario are for example purposes only. To prevent a compromise to your system or network security, you should never use these passwords as part of your own configuration.</p>
<p>Do you want to create a batch file to automate adding the service principals for System A to the Kerberos registry?</p>	<p>Yes</p>
<p>Do you want to include passwords with the IBM i service principals in the batch file?</p>	<p>Yes</p>
<p>As you exit the Network Authentication Service wizard, you will return to the EIM Configuration wizard. Use the following information to complete the EIM Configuration wizard:</p>	
<p>Specify user information that the wizard should use when configuring the directory server. This is the connection user. You must specify the port number, administrator distinguished name, and a password for the administrator.</p> <p>Note: Specify the LDAP administrator's distinguished name (DN) and password to ensure the wizard has enough authority to administer the EIM domain and the objects in it.</p>	<p>Port: 389 Distinguished name: cn=administrator Password: mycopwd</p> <p>Note: Any and all passwords specified in this scenario are for example purposes only. To prevent a compromise to your system or network security, you should never use these passwords as part of your own configuration.</p>
<p>What is the name of the EIM domain that you want to create?</p>	<p>MyCoEimDomain</p>
<p>Do you want to specify a parent DN for the EIM domain?</p>	<p>No</p>
<p>Which user registries do you want to add to the EIM domain?</p>	<p>Local IBM i--SYSTEMA.MYCO.COM Kerberos--MYCO.COM</p> <p>Note: The Kerberos principals stored on the Windows server are not case sensitive; therefore you should not select Kerberos user identities are case sensitive.</p>
<p>Which EIM user do you want System A to use when performing EIM operations? This is the system user.</p> <p>Note: If you have not configured the directory server before configuring single sign-on, the only distinguished name (DN) you can provide for the system user is the LDAP administrator's DN and password.</p>	<p>User type: Distinguished name and password User: cn=administrator Password: mycopwd</p> <p>Note: Any and all passwords specified in this scenario are for example purposes only. To prevent a compromise to your system or network security, you should never use these passwords as part of your own configuration.</p>

Table 2. Single sign-on configuration planning work sheet for System A (continued)

Configuration planning work sheet for System A	Answers
After you complete the EIM Configuration wizard, use the following information to complete the remaining steps required for configuring single sign-on:	
What is the IBM i user profile name for the user?	JOHND
What is the name of the EIM identifier that you want to create?	John Day
What kinds of associations do you want to create?	Source association: Kerberos principal jday Target association: IBM i user profile JOHND
What is the name of the user registry that contains the Kerberos principal for which you are creating the source association?	MYCO.COM
What is the name of the user registry that contains the IBM i user profile for which you are creating the target association?	SYSTEMA.MYCO.COM
What information do you need to supply to test EIM identity mapping?	Source registry: MYCO.COM Source user: jday Target registry: SYSTEMA.MYCO.COM

Related information

[Enterprise Identity Mapping \(EIM\)](#)

Creating a basic single sign-on configuration for System A

The EIM Configuration wizard helps you create a basic EIM configuration and also opens the Network Authentication Service wizard to allow you to create a basic network authentication service configuration.

Note: Instructions in this scenario are based on the assumption that the IBM Tivoli Directory Server for IBM i has not been previously configured on System A. However, if you already configured the directory server, you can still use these instructions with only slight differences. These differences are noted in the appropriate places within the configuration steps.

When you have finished this step, you will have completed the following tasks:

- Created a new EIM domain
 - Configured the directory server on System A to be the EIM domain controller
 - Configured network authentication service
 - Created EIM registry definitions for the System A IBM i registry and the Kerberos registry in the newly created EIM domain
 - Configured System A to participate in the EIM domain
1. In IBM Navigator for i, expand **IBM i Management > Network > All Tasks > Enterprise Identity Mapping > Configuration**.
 2. Click **Configure** to start the EIM Configuration wizard.
 3. On the **Welcome** page, select **Create and join a new domain**. Click **Next**.
 4. On the **Specify EIM Domain Location** page, select **On the local Directory server**. Click **Next** and the Network Authentication Service wizard is displayed.

Note: The Network Authentication Service wizard only displays when the system determines that you need to enter additional information to configure network authentication service for the single sign-on implementation.

5. Complete these tasks to configure network authentication service:

a) On the **Configure Network Authentication Service** page, select **Yes**.

Note: This launches the Network Authentication Service wizard. With this wizard, you can configure several IBM i interfaces and services to participate in a Kerberos realm.

b) On the **Specify Realm Information** page, enter MYCO.COM in the **Default realm** field and select **Microsoft Active Directory is used for Kerberos authentication**. Click **Next**.

c) On the **Specify KDC Information** page, enter kdc1.myco.com in the **KDC** field and enter 88 in the **Port** field. Click **Next**.

d) On the **Specify Password Server Information** page, select **Yes**. Enter kdc1.myco.com in the **Password server** field and 464 in the **Port** field. Click **Next**.

e) On the **Select Keytab Entries** page, select IBM i **Kerberos Authentication**. Click **Next**.

f) On the **Create IBM i Keytab Entry** page, enter and confirm a password, and click **Next**. For example, systema123. This password will be used when System A is added to the Kerberos server.

Note: Any and all passwords specified in this scenario are for example purposes only. To prevent a compromise to your system or network security, you should never use these passwords as part of your own configuration.

g) Optional: On the **Create Batch File** page, select **Yes**, specify the following information, and click **Next**:

- **Batch file:** Add the text systema to the end of the default batch file name. For example, /QIBM/UserData/OS400/iSeriesNavigator/config/NASConfig_systema.bat.
- Select **Include password**. This ensures that all passwords associated with the IBM i service principal are included in the batch file. It is important to note that passwords are displayed in clear text and can be read by anyone with read access to the batch file. Therefore, it is recommended that you delete the batch file from the Kerberos server and from the IBM i immediately after use.

Note: If you do not include the password, you will be prompted for the password when the batch file is run.

h) On the **Summary** page, review the network authentication service configuration details and click **Finish** to complete the Network Authentication Service wizard and return to the EIM Configuration wizard.

6. On the **Configure Directory Server** page, enter the following information, and click **Next**:

Note: If you configured the directory server before you started this scenario, you will see the **Specify User for Connection** page instead of the **Configure Directory Server** page. In that case, you must specify the distinguished name and password for the LDAP administrator.

- **Port:** 389
- **Distinguished name:** cn=admin
- **Password:** mycopwd

Note: Any and all passwords specified in this scenario are for example purposes only. To prevent a compromise to your system or network security, you should never use these passwords as part of your own configuration.

7. On the **Specify Domain** page, enter the name of the domain in the **Domain** field, and click **Next**. For example, MyCoEimDomain.

8. On the **Specify Parent DN for Domain** page, select **No**, and click **Next**.

Note: If the directory server is active, a message is displayed that indicates you need to end and restart the directory server for the changes to take effect. Click **Yes** to restart the directory server.

9. On the **Registry Information** page, select **Local IBM i** and **Kerberos**, and click **Next**. Write down the registry names. You will need these registry names when you create associations to EIM identifiers.

Note:

- Registry names must be unique to the domain.
 - You can enter a specific registry definition name for the user registry if you want to use a specific registry definition naming plan. However, for this scenario you can accept the default values.
10. On the **Specify EIM System User** page, select the user the operating system uses when performing EIM operations on behalf of operating system functions, and click **Next**.

Note: Because you did not configure the directory server prior to performing the steps in this scenario, the only distinguished name (DN) that you can choose is the LDAP administrator's DN.

- **User type:** Distinguished name and password
- **Distinguished name:** cn=administrator
- **Password:** mycopwd

Note: Any and all passwords specified in this scenario are for example purposes only. To prevent a compromise to your system or network security, you should never use these passwords as part of your own configuration.

11. On the **Summary** page, confirm the EIM configuration information. Click **Finish**.

Now that you have completed a basic EIM and network authentication service configuration on System A, you can add the service principal for System A to the Kerberos server.

Adding System A service principal to the Kerberos server

You can use one of two methods to add the necessary IBM i service principal to the Kerberos server.

You can manually add the service principal or, as this scenario illustrates, you can use a batch file to add it. You created this batch file in Step 2. To use this file, you can use the IFS download function in IBM Navigator for i to copy the file to the Kerberos server and run it.

Follow these steps to use the batch file to add principals to the Kerberos server:

Download the batch file created by the wizard to your Kerberos server.

As the administrator on your Windows server do the following:

- a) In IBM Navigator for i on System A, expand **IBM i Management > File Systems > Integrated File System > Root > QIBM > UserData > OS400 > iSeriesNavigator > config**
- b) Right-click **NASConfig_systema.bat** and select **Download**.
- c) Click the **Download** button on the Confirm Download page.
- d) Save the file, this will put it in your browser's download location. Refer to your browser's documentation for how to customize the download folder location. Usually this is the **Downloads** folder.

Note: It is recommended that you now delete the **NASConfig_systema.bat** file from System A.

Run the batch file on kdc1.myco.com

1. On your Windows server, open the directory where you downloaded the batch file.
2. Find the **NASConfig_systema.bat** file and double-click the file to run it.
3. After the file runs, verify that the IBM i principal has been added to the Kerberos server by completing the following:
 - a. On your Windows server, expand **Administrative Tools > Active Directory Users and Computers**.
 - b. Verify the IBM i has a user account by selecting the appropriate Windows domain and clicking **Users**.

Note: This Windows domain should be the same as the default realm name that you specified in the network authentication service configuration.

- c. In the list of users that is displayed, find **systema_1_krb5vr400**. This is the user account generated for the IBM i principal name.
- d. (Optional) Access the properties on your Active Directory user. From the **Delegation** tab, select **Trust this user for delegation to any service (Kerberos only)**.

Note: This optional step enables your system to delegate, or forward, a user's credentials to other systems. As a result, the IBM i service principal can access services on multiple systems on behalf of the user. This is useful in a multi-tier network.

Now that you have added the System A service principal to the Kerberos server, you can create a home directory for John Day.

Creating home directory for John Day on System A

You need to create a directory in the /home directory to store your Kerberos credentials cache.

To create a home directory, complete the following:

On a command line, enter: `CRTDIR '/home/user profile'` where `user profile` is your IBM i user profile name. For example: `CRTDIR '/home/JOHND'`.

Now that you have created the home directory, you can verify that network authentication service is configured correctly.

Testing network authentication service configuration on System A

Now that you have completed the network authentication service configuration tasks for System A, you need to test that your configuration works correctly. You can do this by requesting a ticket granting ticket for the System A principal name

To test the network authentication service configuration, follow these steps:

Note: Ensure that you have created a home directory for your IBM i user profile before performing this procedure.

1. On a command line, enter `QSH` to start the Qshell Interpreter.
2. Enter `keytab list` to display a list of principals registered in the keytab file. In this scenario, `krb5vr400/systema.myco.com@MYCO.COM` should display as the principal name for System A.
3. Enter `kinit -k krb5vr400/systema.myco.com@MYCO.COM`. If this is successful, then the `kinit` command is displayed without errors.
4. Enter `klist` to verify that the default principal is `krb5vr400/systema.myco.com@MYCO.COM`.

Now that you have tested the network authentication service configuration, you can create an EIM identifier for John Day.

Creating an EIM identifier for John Day

Now that you have performed the initial steps to create a basic single sign-on configuration, you can begin to add information to this configuration to complete your single sign-on test environment.

You need to create the EIM identifier that you specified in the planning work sheet. In this scenario, this EIM identifier is a name that uniquely identifies you, John Day, in your enterprise.

To create an EIM identifier, follow these steps:

1. In IBM Navigator for i, expand **IBM i Management > Network > All Tasks > Enterprise Identity Mapping**.
2. Click **Domain Management**.
3. Right-click **MyCoEimDomain** and select **Open**.

Note: You might be prompted to connect to the domain controller. In that case, the **Connect to EIM Domain Controller** dialog box is displayed. You must connect to the domain before you can perform actions in it. To connect to the domain controller, provide the following information and click **OK**:

- **User type:** Distinguished name
- **Distinguished name:** cn=administrator
- **Password:** mycopwd

Note: Any and all passwords specified in this scenario are for example purposes only. To prevent a compromise to your system or network security, you should never use these passwords as part of your own configuration.

4. Right-click **Identifiers** and select **New Identifier**.
5. On the **New EIM Identifier** dialog box, enter a name for the new identifier in the **Identifier** field, and click **OK**. For example, John Day.

Now that you have created your identifier, you can add associations to the identifier to define the relationship between the identifier and the corresponding Kerberos principal and IBM i user profile.

Testing EIM identity mappings

You need to verify that EIM mapping lookup operations return the correct results based on the configured associations.

To test that EIM mapping operations work correctly, follow these steps:

1. In IBM Navigator for i, expand **IBM i Management > Network > All Tasks > Enterprise Identity Mapping**.
2. Click **Domain Management**.
3. Right-click **MyCoEimDomain** and select **Test a mapping**.

Note: You might be prompted to connect to the domain controller. In that case, the **Connect to EIM Domain Controller** dialog box is displayed. You must connect to the domain before you can perform actions in it. To connect to the domain controller, provide the following information and click **OK**:

- **User type:** Distinguished name
- **Distinguished name:** cn=administrator
- **Password:** mycopwd

Note: Any and all passwords specified in this scenario are for example purposes only. To prevent a compromise to your system or network security, you should never use these passwords as part of your own configuration.

4. In the **Test a mapping** dialog box, specify or **Browse** to select the following information:
 - **Source registry:** MYCO.COM
 - **Source user:** jday
 - **Target registry:** SYSTEMA.MYCO.COM

Note: Click **?** for help, if necessary, for more details about what information is needed for each field in the dialog box.

Click **Test**, and click **Close**.

If your EIM mappings are correctly configured, the following results are displayed in the **Mapping found** portion of the page:

For these fields	See these results
Target user	JOHND
Origin	EIM Identifier: John Day

If you receive messages or errors that indicate problems with your mappings or with communications, see [EIM troubleshooting](#) to help you find solutions to these problems.

Now that you have tested the EIM identify mappings, you can configure IBM i Access Client Solutions applications to use Kerberos authentication.

Configuring IBM i Access Client Solutions applications to use Kerberos authentication

You must use Kerberos to authenticate before you can use IBM i Access Client Solutions applications to access your system. Therefore, from your PC, you need to configure IBM i Access Client Solutions to use Kerberos authentication.

To configure IBM i Access Client Solutions applications to use Kerberos authentication, complete the following steps:

Note: Each of your users needs to perform all of these steps on their own PC.

1. Log on to the Windows domain by signing in to your PC.
2. In IBM i Access Client Solutions on your PC, select **Actions > Management > System Configurations**.
3. On the **System Configuration** page, select **System A** and click **Edit**.
4. On the **Connection** tab, select **Use kerberos authentication; do not prompt**. Click **OK**. This will allow IBM i Access Client Solutions connections to use the Kerberos principal name and password for authentication.
5. On the System Configuration page, click **Close**.
6. Repeat these steps for System B.

Now that you have configured IBM i Access Client Solutions applications to use Kerberos authentication, you can verify the single sign-on environment.

Verifying network authentication service and EIM configuration

Now that you have verified the individual pieces of your single sign-on configuration and ensured that all setup is complete, you must verify that you have configured EIM and network authentication service correctly and that single sign-on works as expected.

Note: When using the 5250 emulator in IBM i Access Client Solutions with Kerberos Authentication, you need to change the **Remote sign-on (QRMTSIGN)** system value to *VERIFY to enable you to bypass the sign-on. To change the **Remote sign-on** system value, follow these steps:

1. In IBM Navigator for i on System A, expand **IBM i Management > Configuration and Service**.
2. Click **System Values**.
3. Right-click **Signon** and select **Properties**.
4. On the Remote page, select **Allow sign-on to be bypassed** and **Verify user ID on target system**, and click **OK**.

To verify that your single sign-on environment works correctly, have John Day follow these steps:

1. In IBM i Access Client Solutions,
 - a) On the **System** pull-down, select **System A**.
 - b) Expand **General** and click **5250 Emulator** to open a connection to System A.
2. An emulator session is started for System A and no sign-on prompt displays. To verify the session is signed on as JOHND, John Day's IBM i user profile, enter the **DSPJOB** command in the emulator session and check that the **USER:** field shows JOHND.

IBM i Access Client Solutions 5250 emulator session successfully used EIM to map the jday Kerberos principal to the JOHND System A user profile because of the associations defined for EIM identifier, John Day. The emulator session for System A is now connected as JOHND.

(Optional) Postconfiguration considerations

Now that you finished this scenario, the only EIM user you have defined that EIM can use is the DN for the LDAP administrator.

The LDAP administrator DN that you specified for the system user on System A has a high level of authority to all data on the directory server. Therefore, you might consider creating one or more DNs as additional users that have more appropriate and limited access control for EIM data. The number of additional EIM users that you define depends on your security policy's emphasis on the separation of security duties and responsibilities. Typically, you might create at least the two following types of DNs:

- **A user that has EIM administrator access control**

This EIM administrator DN provides the appropriate level of authority for an administrator who is responsible for managing the EIM domain. This EIM administrator DN can be used to connect to the domain controller when managing all aspects of the EIM domain by means of IBM Navigator for i.

- **At least one user that has all of the following access controls:**

- Identifier administrator
- Registry administrator
- EIM mapping operations

This user provides the appropriate level of access control required for the system user that performs EIM operations on behalf of the operating system.

Note: To use this new DN for the system user instead of the LDAP administrator DN, you must change the EIM configuration properties for each system. For this scenario, you need to change the EIM configuration properties for any IBM i that you set up.

Related information

[Managing EIM configuration properties](#)

Scenario: Enabling single sign-on for IBM i

View this scenario to learn how to configure network authentication service and EIM to create a single sign-on environment across multiple systems in an enterprise. This scenario expands on the concepts and tasks presented in the previous scenario which demonstrates how to create a simple single sign-on test environment.

Situation

You are a network administrator that manages a network and network security for your company, including the Order Receiving department. You oversee the IT operations for a large number of employees who take customer orders over the telephone. You also supervise two other network administrators who help you maintain the network.

The employees in the Order Receiving department use Windows and IBM i and require multiple passwords for the different applications they use every day. Consequently, you spend a lot of time managing and troubleshooting problems related to passwords and user identities, such as resetting forgotten passwords.

As the company's network administrator, you are always looking for ways to improve the business, starting with the Order Receiving department. You know that most of your employees need the same type of authority to access the application that they use to query inventory status. It seems redundant and time consuming for you to maintain individual user profiles and numerous passwords that are required in this situation. In addition, you know that all of your employees can benefit by using fewer user IDs and passwords. You want to do these things:

- Simplify the task of password management for the Order Receiving department. Specifically, you want to efficiently manage user access to the application your employees routinely use for customer orders.

- Decrease the use of multiple user IDs and passwords for the department employees, as well as for the network administrators. However, you do not want to make the Windows IDs and IBM i user profiles the same nor do you want to use password caching or syncing.

Based on your research, you know that IBM i supports single sign-on, a solution that allows your users to log on once to access multiple applications and services that normally require them to log on with multiple user IDs and passwords. Because your users do not need to provide as many user IDs and passwords to do their jobs, you have fewer password problems to solve for them. Single sign-on seems to be an ideal solution because it allows you to simplify password management in the following ways:

- For typical users that require the same authority to an application, you can create policy associations. For example, you want the order clerks in the Order Receiving department to be able to log on once with their Windows user name and password and then be able to access a new inventory query application in the manufacturing department without having to be authenticated again. However, you also want to ensure that the level of authorization that they have when using this application is appropriate. To attain this goal, you decide to create a policy association that maps the Windows user identities for this group of users to a single IBM i user profile that has the appropriate level of authority for running the inventory query application. Because this is a query-only application in which users cannot change data, you are not as concerned about detailed auditing for this application. Consequently, you feel confident that using a policy association in this situation conforms to your security policy.

You create a policy association to map the group of order clerks with similar authority requirements to a single IBM i user profile with the appropriate level of authority for the inventory query application. Your users benefit by having one less password to remember and one less logon to perform. As the administrator, you benefit by having to maintain only one user profile for user access to the application instead of multiple user profiles for everyone in the group.

- For each of your network administrators who have user profiles with special authorities, such as *ALLOBJ and *SECADM, you can create identifier associations. For example, you want all of the user identities for a single network administrator to be precisely and individually mapped to one another because of the administrator's high level of authority.

Based on your company's security policy, you decide to create identifier associations to map specifically from each network administrator's Windows identity to his IBM i user profile. You can more easily monitor and trace the activity of the administrator because of the one-to-one mapping that identifier associations provide. For example, you can monitor the jobs and objects that run on the system for a specific user identity. Your network administrator benefits by having one less password to remember and one less logon to perform. As the network administrator, you benefit by tightly controlling the relationships between all of your administrator's user identities.

This scenario has the following advantages:

- Simplifies authentication process for users.
- Simplifies managing access to applications.
- Eases the overhead of managing access to servers in the network.
- Minimizes the threat of password theft.
- Avoids the need for multiple signons.
- Simplifies user identity management across the network.

Objectives

In this scenario, you are the administrator at MyCo, Inc. who wants to enable single sign-on for the users in the Order Receiving department.

The objectives of this scenario are as follows:

- System A and System B must participate in the MYCO.COM realm to authenticate the users and services that are participating in this single sign-on environment. To enable the systems to use Kerberos, System A and System B must be configured for network authentication service.

- The IBM Tivoli Directory Server for IBM i (LDAP) on System A must function as the domain controller for the new EIM domain.

Note: Refer to [domains](#) to learn how two different types of domains, an EIM domain and a Windows domain, fit into the single sign-on environment.

- All user identities in the Kerberos registry must map successfully to a single IBM i user profile with appropriate authority for user access to the inventory query application.
- Based on your security policy, two administrators, John Day and Sharon Jones, who also have user identities in the Kerberos registry, must have identifier associations to map these identities to their IBM i user profiles which have *SECADM special authority. These one-to-one mappings enable you to closely monitor the jobs and objects that run on the system for these user identities.
- A Kerberos service principal must be used to authenticate the users to the IBM i Access Client Solutions applications.

Details

The following figure illustrates the network environment for this scenario.

The figure illustrates the following points relevant to this scenario.

EIM domain data defined for the enterprise

- Three registry definition names:
 - A registry definition name of MYCO.COM for the Windows server registry. You will define this when you use the EIM configuration wizard on System A.
 - A registry definition name of SYSTEMA.MYCO.COM for the IBM i registry on System A. You will define this when you use the EIM configuration wizard on System A.
 - A registry definition name of SYSTEMB.MYCO.COM for the IBM i registry on System B. You will define this when you use the EIM configuration wizard on System B.

- Two default registry policy associations:

Note: EIM lookup operation processing assigns the highest priority to identifier associations. Therefore, when a user identity is defined as a source in both a policy association and an identifier association, only the identifier association maps that user identity. In this scenario, two network administrators, John Day and Sharon Jones, both have user identities in the MYCO.COM registry, which is the source of the default registry policy associations. However, as shown below, these administrators also have identifier associations defined for their user identities in the MYCO.COM registry. The identifier associations ensure that their MYCO.COM user identities are not mapped by the policy associations. Instead, the identifier associations ensure that their user identities in the MYCO.COM registry are individually mapped to other specific individual user identities.

- One default registry policy association maps all user identities in the Windows server registry called MYCO.COM, to a single IBM i user profile called SYSUSERA in the SYSTEMA.MYCO.COM registry on System A. For this scenario, mmiller and ksmith represent two of these user identities.
- One default registry policy association maps all user identities in the Windows server registry called MYCO.COM, to a single IBM i user profile called SYSUSERB in the SYSTEMB.MYCO.COM registry on System B. For this scenario, mmiller and ksmith represent two of these user identities.
- Two EIM identifiers named John Day and Sharon Jones to represent the two network administrators in the company who have those names.
- For the John Day EIM identifier, these identifier associations are defined:
 - A source association for the jday user identity, which is a Kerberos principal in the Windows server registry.
 - A target association for the JOHND user identity, which is a user profile in the IBM i registry on System A.

- A target association for the DAYJO user identity, which is a user profile in the IBM i registry on System B.
- For the Sharon Jones EIM identifier, these identifier associations are defined:
 - A source association for the sjones user identity, which is a Kerberos principal in the Windows server registry.
 - A target association for the SHARONJ user identity, which is a user profile in the IBM i registry on System A.
 - A target association for the JONSSH user identity, which is a user profile in the IBM i registry on System B.

Windows server

- Acts as the Kerberos server (kdc1.myco.com), also known as a key distribution center (KDC), for the network.
- The default realm for the Kerberos server is MYCO.COM.
- All Microsoft Windows Active Directory users that do not have identifier associations are mapped to a single IBM i user profile on each of the IBM i systems.

System A

- Runs IBM i with the following options and licensed programs installed:
 - IBM i Host Servers (5770-SS1 Option 12)
 - Qshell Interpreter (5770-SS1 Option 30)
- The directory server on System A will be configured to be the EIM domain controller for the new EIM domain, MyCoEimDomain.
- Participates in the EIM domain, MyCoEimDomain.
- Has the service principal name of krb5vr400/systema.myco.com@MYCO.COM.
- Has the fully qualified host name of systema.myco.com. This name is registered in a single Domain Name System (DNS) to which all PCs and servers in the network point.
- Home directories on System A store the Kerberos credentials caches for IBM i user profiles.

System B

- Runs IBM i with the following options and licensed programs installed:
 - IBM i Host Servers (5770-SS1 Option 12)
 - Qshell Interpreter (5770-SS1 Option 30)
- Has the fully qualified host name of systemb.myco.com. This name is registered in a single Domain Name System (DNS) to which all PCs and servers in the network point.
- The principal name for System B is krb5vr400/systemb.myco.com@MYCO.COM.
- Participates in the EIM domain, MyCoEimDomain.
- Home directories on System B store the Kerberos credentials caches for IBM i user profiles.

Administrative PC

- Runs Microsoft Windows operating system.
- Serves as the primary logon system for the administrator.
- Configured to be part of the MYCO.COM realm (Windows domain).

Prerequisites and assumptions

Successful completion of this scenario requires that the following assumptions and prerequisites are met:

1. All system requirements, including software and operating system installation, have been verified.

To verify that these licensed programs have been installed, complete the following:

- a. In IBM Navigator for i, expand **IBM i Management > Configuration and Service > Software**.
 - b. Click **Installed Products**.
 - c. Ensure that all the necessary licensed programs are installed.
2. All necessary hardware planning and setup are complete.
 3. TCP/IP and basic system security are configured and tested on each system.
 4. The directory server and EIM should not be previously configured on System A.

Note: Instructions in this scenario are based on the assumption that the directory server has not been previously configured on System A. However, if you already configured the directory server, you can still use these instructions with only slight differences. These differences are noted in the appropriate places within the configuration steps.

5. A single DNS server is used for host name resolution for the network. Host tables are not used for host name resolution.

Note: The use of host tables with Kerberos authentication might result in name resolution errors or other problems.

Configuration steps

Note: You need to thoroughly understand the concepts related to single sign-on, which include network authentication service and Enterprise Identity Mapping (EIM) concepts, before you accomplish this scenario. If you are ready to continue with this scenario complete the following steps:

Related tasks

[Configuring single sign-on](#)

To configure a single sign-on environment you must use a compatible authentication method as your authentication method and Enterprise Identity Mapping (EIM) to create and manage your user profiles and identity mappings.

Related information

[Host name resolution considerations](#)

[Enterprise Identity Mapping \(EIM\)](#)

[EIM associations](#)

[Host name resolution](#)

Completing the planning work sheets

The following planning work sheets are tailored to fit this scenario based on the general single sign-on planning worksheets.

These planning work sheets demonstrate the information that you need to gather and the decisions you need to make as you prepare to configure the single sign-on implementation described by this scenario. To ensure a successful implementation, you must be able to answer Yes to all prerequisite items in the work sheet and you should gather all the information necessary to complete the work sheets before you perform any configuration tasks.

Note: You need to thoroughly understand the concepts related to single sign-on, which include network authentication service and Enterprise Identity Mapping (EIM) concepts, before you implement this scenario.

<i>Table 3. Single sign-on prerequisite work sheet</i>	
Prerequisite work sheet	Answers
Are the following options and licensed programs installed on System A and System B? <ul style="list-style-type: none"> • IBM i Host Servers (5770-SS1 Option 12) • Qshell Interpreter (5770-SS1 Option 30) 	Yes

<i>Table 3. Single sign-on prerequisite work sheet (continued)</i>	
Prerequisite work sheet	Answers
Have you installed an application that is enabled for single sign-on on each of the PCs that will participate in the single sign-on environment? Note: For this scenario, all of the participating PCs have IBM i Access Client Solutions (5733-XJ1) installed. See IBM i Access Client Solutions: Getting Started	Yes
Do you, the administrator, have *SECADM, *ALLOBJ, and *IOSYSCFG special authorities?	Yes
Do you have one of the following systems acting as the Kerberos server (also known as the KDC)? If yes, specify which system. 1. Windows server 2. IBM i PASE 3. AIX server 4. z/OS	Yes, Windows server
Are all your PCs in your network configured in a Windows domain?	Yes
Have you applied the latest program temporary fixes (PTFs)?	Yes
Is the IBM i time within 5 minutes of the system time on the Kerberos server? If not see, Synchronize system times .	Yes
Are you running IBM i PASE for the Kerberos server?	You must have IBM Network Authentication Enablement for i (5770-NAE) installed.

You need this information to configure EIM and network authentication service on System A

<i>Table 4. Single sign-on configuration planning work sheet for System A</i>	
Configuration planning work sheet for System A	Answers
Use the following information to complete the EIM Configuration wizard. The information in this work sheet correlates with the information you need to supply for each page in the wizard:	
How do you want to configure EIM for your system? <ul style="list-style-type: none"> • Join an existing domain • Create and join a new domain 	Create and join a new domain
Where do you want to configure the EIM domain?	On the local directory server Note: This will configure the directory server on the same system on which you are currently configuring EIM.
Do you want to configure network authentication service? Note: You must configure network authentication service to configure single sign-on.	Yes
The Network Authentication Service wizard launches from the EIM Configuration wizard. Use the following information to complete the Network Authentication Service wizard.	

Table 4. Single sign-on configuration planning work sheet for System A (continued)

Configuration planning work sheet for System A	Answers
<p>What is the name of the Kerberos default realm to which your IBM i will belong?</p> <p>Note: A Windows server domain is similar to a Kerberos realm.</p>	<p>MYCO.COM</p>
<p>Are you using Microsoft Active Directory?</p>	<p>Yes</p>
<p>What is the Kerberos server, also known as a key distribution center (KDC), for this Kerberos default realm? What is the port on which the Kerberos server listens?</p>	<p>KDC: kdc1.myco.com Port: 88</p> <p>Note: This is the default port for the Kerberos server.</p>
<p>Do you want to configure a password server for this default realm? If yes, answer the following questions:</p> <p>What is name of the password server for this Kerberos server? What is the port on which the password server listens?</p>	<p>Yes</p> <p>Password server: kdc1.myco.com Port: 464</p> <p>Note: This is the default port for the password server.</p>
<p>For which services do you want to create keytab entries?</p> <ul style="list-style-type: none"> • IBM i Kerberos Authentication • LDAP • IBM HTTP Server for i • IBM i NetServer • IBM i Network File System (NFS) Server • IBM i Network FTP Server 	<p>IBM i Kerberos Authentication</p>
<p>What is the password for your service principal or principals?</p>	<p>systema123</p> <p>Note: Any and all passwords specified in this scenario are for example purposes only. To prevent a compromise to your system or network security, you should never use these passwords as part of your own configuration.</p>
<p>Do you want to create a batch file to automate adding the service principals for System A to the Kerberos registry?</p>	<p>Yes</p>
<p>Do you want to include passwords with the IBM i service principals in the batch file?</p>	<p>Yes</p>
<p>As you exit the Network Authentication Service wizard, you will return to the EIM Configuration wizard. Use the following information to complete the EIM Configuration wizard:</p>	

Table 4. Single sign-on configuration planning work sheet for System A (continued)

Configuration planning work sheet for System A	Answers
<p>Specify user information that the wizard should use when configuring the directory server. This is the connection user. You must specify the port number, administrator distinguished name, and a password for the administrator.</p> <p>Note: Specify the LDAP administrator's distinguished name (DN) and password to ensure the wizard has enough authority to administer the EIM domain and the objects in it.</p>	<p>Port: 389 Distinguished name: cn=administrator Password: mycopwd</p> <p>Note: Any and all passwords specified in this scenario are for example purposes only. To prevent a compromise to your system or network security, you should never use these passwords as part of your own configuration.</p>
<p>What is the name of the EIM domain that you want to create?</p>	<p>MyCoEimDomain</p>
<p>Do you want to specify a parent DN for the EIM domain?</p>	<p>No</p>
<p>Which user registries do you want to add to the EIM domain?</p>	<p>Local IBM i --SYSTEMA.MYCO.COM Kerberos--KDC1.MYCO.COM</p> <p>Note: You should not select Kerberos user identities are case sensitive when the wizard presents this option.</p>
<p>Which EIM user do you want System A to use when performing EIM operations? This is the system user.</p> <p>Note: If you have not configured the directory server prior to configuring single sign-on, the only distinguished name (DN) you can provide for the system user is the LDAP administrator's DN and password.</p>	<p>User type: Distinguished name Distinguished name: cn=administrator Password: mycopwd</p> <p>Note: Any and all passwords specified in this scenario are for example purposes only. To prevent a compromise to your system or network security, you should never use these passwords as part of your own configuration.</p>

You need this information to allow System B to participate in the EIM domain and to configure network authentication service on System B

Table 5. Single sign-on configuration planning work sheet for System B

Configuration planning work sheet for System B	Answers
<p>Use the following information to complete the EIM Configuration wizard for System B:</p>	
<p>How do you want to configure EIM on your system?</p>	<p>Join an existing domain</p>
<p>Do you want to configure network authentication service?</p> <p>Note: You must configure network authentication service to configure single sign-on.</p>	<p>Yes</p>

Table 5. Single sign-on configuration planning work sheet for System B (continued)

Configuration planning work sheet for System B	Answers
<p>The Network Authentication Service wizard launches from the EIM Configuration wizard. Use the following information to complete the Network Authentication Service wizard:</p> <p>Note: You can launch the Network Authentication Service wizard independently of the EIM Configuration wizard.</p>	
<p>What is the name of the Kerberos default realm to which your IBM i will belong?</p> <p>Note: A Windows server domain is equivalent to a Kerberos realm.</p>	<p>MYCO.COM</p>
<p>Are you using Microsoft Active Directory?</p>	<p>Yes</p>
<p>What is the Kerberos server for this Kerberos default realm? What is the port on which the Kerberos server listens?</p>	<p>KDC: kdc1.myco.com Port: 88</p> <p>Note: This is the default port for the Kerberos server.</p>
<p>Do you want to configure a password server for this default realm? If yes, answer the following questions:</p> <p>What is name of the password server for this Kerberos server? What is the port on which the password server listens?</p>	<p>Yes</p> <p>Password server: kdc1.myco.com Port: 464</p> <p>Note: This is the default port for the password server.</p>
<p>For which services do you want to create keytab entries?</p> <ul style="list-style-type: none"> • IBM i Kerberos Authentication • LDAP • IBM HTTP Server for i • IBM i NetServer • IBM i Network File System (NFS) Server • IBM i Network FTP Server 	<p>IBM i Kerberos Authentication</p>
<p>What is the password for your IBM i service principals?</p>	<p>systemb123</p> <p>Note: Any and all passwords specified in this scenario are for example purposes only. To prevent a compromise to your system or network security, you should never use these passwords as part of your own configuration.</p>
<p>Do you want to create a batch file to automate adding the service principals for System B to the Kerberos registry?</p>	<p>Yes</p>
<p>Do you want to include passwords with the IBM i service principals in the batch file?</p>	<p>Yes</p>
<p>As you exit the Network Authentication Service wizard, you will return to the EIM Configuration wizard. Use the following information to complete the EIM Configuration wizard for System B:</p>	
<p>What is the name of the EIM domain controller for the EIM domain that you want to join?</p>	<p>systema.myco.com</p>

Table 5. Single sign-on configuration planning work sheet for System B (continued)

Configuration planning work sheet for System B	Answers
Do you plan on securing the connection with SSL or TLS?	No
What is the port on which the EIM domain controller listens?	389
Which user do you want to use to connect to the domain controller? This is the connection user. Note: Specify the LDAP administrator's distinguished name (DN) and password to ensure the wizard has enough authority to administer the EIM domain and the objects in it.	User type: Distinguished name and password Distinguished name: cn=administrator Password: mycopwd Note: Any and all passwords specified in this scenario are for example purposes only. To prevent a compromise to your system or network security, you should never use these passwords as part of your own configuration.
What is the name of the EIM domain that you want to join?	MyCoEimDomain
Do you want to specify a parent DN for the EIM domain?	No
What is the name of the user registry that you want to add to the EIM domain?	Local IBM i --SYSTEMB.MYCO.COM
Which EIM user do you want System B to use when performing EIM operations? This is the system user. Note: Earlier in this scenario, you used the EIM Configuration wizard to configure the directory server on System A. In doing so, you created a DN and password for the LDAP administrator. This is currently the only DN defined for the directory server. Therefore, this is the DN and password you must supply here.	User type: Distinguished name and password Distinguished name: cn=administrator Password: mycopwd Note: Any and all passwords specified in this scenario are for example purposes only. To prevent a compromise to your system or network security, you should never use these passwords as part of your own configuration.

Table 6. Single sign-on configuration planning work sheet - user profiles

IBM i user profile name	Password is specified	Special authority (Privilege class)	System
SYSUSERA	No	User	System A
SYSUSERB	No	User	System B

Table 7. Single sign-on configuration planning work sheet - EIM domain data

Identifier name	User registry	User identity	Association type	Identifier description
John Day	MYCO.COM	jday	Source	Kerberos (Windows) login user identity

Identifier name	User registry	User identity	Association type	Identifier description
John Day	SYSTEMA.MYCO.COM	JOHND	Target	IBM i user profile on System A
John Day	SYSTEMB.MYCO.COM	DAYJO	Target	IBM i user profile on System B
Sharon Jones	MYCO.COM	sjones	Source	Kerberos (Windows) login user identity
Sharon Jones	SYSTEMA.MYCO.COM	SHARONJ	Target	IBM i user profile on System A
Sharon Jones	SYSTEMB.MYCO.COM	JONESSH	Target	IBM i user profile on System B

Policy association type	Source user registry	Target user registry	User identity	Description
Default registry	MYCO.COM	SYSTEMA.MYCO.COM	SYSUSERA	Maps authenticated Kerberos user to appropriate IBM i user profile
Default registry	MYCO.COM	SYSTEMB.MYCO.COM	SYSUSERB	Maps authenticated Kerberos user to appropriate IBM i user profile

Related information

[Enterprise Identity Mapping \(EIM\)](#)

Creating a basic single sign-on configuration for System A

The EIM Configuration wizard helps you create a basic EIM configuration and also opens the Network Authentication Service wizard to allow you to create a basic network authentication service configuration.

Note: Instructions in this scenario are based on the assumption that the IBM Tivoli Directory Server for IBM i has not been previously configured on System A. However, if you already configured the directory server, you can still use these instructions with only slight differences. These differences are noted in the appropriate places within the configuration steps.

Use the information from your work sheets to configure EIM and network authentication service on System A. When you complete this step, you accomplish the following:

- Create a new EIM domain.
- Configure the directory server on System A to be the EIM domain controller.

- Configure network authentication service.
- Create EIM registry definitions for the IBM i registry and the Kerberos registry on System A.
- Configure System A to participate in the EIM domain.
 1. In IBM Navigator for i on System A, expand **IBM i Management > Network > All Tasks > Enterprise Identity Mapping > Configuration**.
 2. Click **Configure** to start the EIM configuration wizard.
 3. On the **Welcome** page, select **Create and join a new domain**. Click **Next**.
 4. On the **Specify EIM Domain Location** page, select **On the local Directory server**. Click **Next**.
 5. Complete these tasks to configure network authentication service:
 - a) On the **Configure Network Authentication Service** page, select **Yes**.

Note: This launches the Network Authentication Service wizard. With this wizard, you can configure several IBM i interfaces and services to participate in the Kerberos realm.
 - b) On the **Specify Realm Information** page, enter MYCO.COM in the **Default realm** field and select **Microsoft Active Directory is used for Kerberos authentication**. Click **Next**.
 - c) On the **Specify KDC Information** page, enter kdc1.myco.com for the name of the Kerberos server in the **KDC** field and enter 88 in the **Port** field. Click **Next**.
 - d) On the **Specify Password Server Information** page, select **Yes**. Enter kdc1.myco.com in the **Password server** field and 464 in the **Port** field. Click **Next**.
 - e) On the **Select Keytab Entries** page, select **IBM i Kerberos Authentication**. Click **Next**.
 - f) On the **Create IBM i Keytab Entry** page, enter and confirm a password, and click **Next**. For example, systema123. This password is used when the System A service principal is added to the Kerberos server.

Note: Any and all passwords specified in this scenario are for example purposes only. To prevent a compromise to your system or network security, you should never use these passwords as part of your own configuration.
 - g) On the **Create Batch File** page, select **Yes**, specify the following information, and click **Next**:
 - **Batch file:** Add the text systema to the end of the default batch file name. For example, /QIBM/UserData/OS400/iSeriesNavigator/config/NASConfig_systema.bat.
 - Select **Include password**. This ensures that all passwords associated with the IBM i service principal are included in the batch file. It is important to note that passwords are displayed in clear text and can be read by anyone with read access to the batch file. Therefore, it is recommended that you delete the batch file from the Kerberos server and from the IBM i immediately after use.

Note: If you do not include the password, you will be prompted for the password when the batch file is run.
 - h) On the **Summary** page, review the network authentication service configuration details. Click **Finish**.
 6. On the **Configure Directory Server** page, enter the following information, and click **Next**.

Note: If you configured the directory server before you started this scenario, you will see the **Specify User for Connection** page instead of the **Configure Directory Server** page. In that case, you must specify the distinguished name and password for the LDAP administrator.

 - **Port:** 389
 - **Distinguished name:** cn=admin
 - **Password:** mycopwd

Note: Any and all passwords specified in this scenario are for example purposes only. To prevent a compromise to your system or network security, you should never use these passwords as part of your own configuration.

7. On the **Specify Domain** page, enter the name of the domain in the **Domain** field. For example, MyCoEimDomain.

8. On the **Specify Parent DN for Domain** page, select **No**. Click **Next**.

Note: If the directory server is active, a message is displayed that indicates you need to end and restart the directory server for the changes to take effect. Click **Yes** to restart the directory server.

9. On the **Registry Information** page, select **Local IBM i** and **Kerberos**. Click **Next**. Write down the registry names. You will need these registry names when you create associations to EIM identifiers.

Note:

- Registry names must be unique to the domain.
- You can enter a specific registry definition name for the user registry if you want to use a specific registry definition naming plan. However, for this scenario you can accept the default values.

10. On the **Specify EIM System User** page, select the user the operating system uses when performing EIM operations on behalf of operating system functions, and click **Next**.

Note: Because you did not configure the directory server prior to performing the steps in this scenario, the only distinguished name (DN) that you can choose is the LDAP administrator's DN.

- **User type:** Distinguished name and password
- **Distinguished name:** cn=administrator
- **Password:** mycopwd

Note: Any and all passwords specified in this scenario are for example purposes only. To prevent a compromise to your system or network security, you should never use these passwords as part of your own configuration.

11. On the **Summary** page, confirm the EIM configuration information. Click **Finish**.

You have completed a basic EIM and network authentication service configuration on System A. The next step is to configure System B to participate in the EIM domain that you just created

Configuring System B to participate in the EIM domain and configure System B for network authentication service

After you have created a new domain and configured network authentication service on System A, you need to configure System B to participate in the EIM domain and configure network authentication service on System B.

Use the information from your work sheets to complete this step.

1. In IBM Navigator for i on System B, expand **IBM i Management > Network > All Tasks > Enterprise Identity Mapping > Configuration**.

2. Click **Configure** to start the EIM configuration wizard.

3. On the **Welcome** page, select **Join an existing domain**. Click **Next**.

4. Complete these tasks to configure network authentication service:

a) On the **Configure Network Authentication Service** page, select **Yes**.

Note: This launches the Network Authentication Service wizard. This wizard allows you to configure several IBM i interfaces and services to participate in a Kerberos network.

b) On the **Specify Realm Information** page, enter MYCO.COM in the **Default realm** field and select **Microsoft Active Directory is used for Kerberos authentication**. Click **Next**.

c) On the **Specify KDC Information** page, enter kdc1.myco.com for the name of the Kerberos server in the **KDC** field and enter 88 in the **Port** field. Click **Next**.

d) On the **Specify Password Server Information** page, select **Yes**. Enter kdc1.myco.com in the **Password server** field and 464 in the **Port** field. Click **Next**.

e) On the **Select Keytab Entries** page, select **IBM i Kerberos Authentication**. Click **Next**.

- f) On the **Create IBM i Keytab Entry** page, enter and confirm a password, and click **Next**. For example, systema123. This password will be used when the System A service principal is added to the Kerberos server.

Note: Any and all passwords specified in this scenario are for example purposes only. To prevent a compromise to your system or network security, you should never use these passwords as part of your own configuration.

- g) On the **Create Batch File** page, select **Yes**, specify the following information, and click **Next**.

- **Batch file:** Add the text systemb to the end of the default batch file name. For example, /QIBM/UserData/OS400/iSeriesNavigator/config/NASConfig_systemb.bat.
- Select **Include password**. This ensures that all passwords associated with the IBM i service principal are included in the batch file. It is important to note that passwords are displayed in clear text and can be read by anyone with read access to the batch file. Therefore, it is recommended that you delete the batch file from the Kerberos server and from the IBM i immediately after use.

Note: If you do not include the password, you will be prompted for the password when the batch file is run.

- h) On the **Summary** page, review the network authentication service configuration details. Click **Finish**.

5. On the **Specify Domain Controller** page, specify the following information, and click **Next**.

- **Domain controller name:** systema.myco.com
- **Port:** 389

6. On the **Specify User for Connection** page, specify the following information, and click **Next**

Note: Specify the LDAP administrator's DN and password that you created earlier in this scenario on System A.

- **User type:** Distinguished name and password
- **Distinguished name:** cn=administrator
- **Password:** mycopwd

Note: Any and all passwords specified in this scenario are for example purposes only. To prevent a compromise to your system or network security, you should never use these passwords as part of your own configuration.

7. On the **Specify Domain** page, select the name of the domain that you want to join. Click **Next**. For example, MyCoEimDomain.

8. On the **Registry Information** page, select **Local IBM i** and deselect **Kerberos registry**. (The Kerberos registry was created when you created the MyCoEimDomain domain.) Click **Next**. Write down the registry names. You will need these registry names when you create associations to EIM identifiers.

Note:

- Registry names must be unique to the domain.
- You can enter a specific registry definition name for the user registry if you want to use a specific [registry definition naming plan](#). However, for this scenario you can accept the default values.

9. On the **Specify EIM System User** page, select the user the operating system uses when performing EIM operations on behalf of operating system functions, and click **Next**.

Note: Specify the LDAP administrator's DN and password that you created earlier in this scenario on System A.

- **User type:** Distinguished name and password
- **Distinguished name:** cn=administrator
- **Password:** mycopwd

Note: Any and all passwords specified in this scenario are for example purposes only. To prevent a compromise to your system or network security, you should never use these passwords as part of your own configuration.

10. On the **Summary** page, confirm the EIM configuration. Click **Finish**.

You have now configured System B to participate in the domain and to use network authentication service.

Adding both IBM i service principals to the Kerberos server

You can use one of two methods to add the necessary IBM i service principals to the Kerberos server.

You can manually add the service principals or, as this scenario illustrates, you can use a batch file to add them. You created this batch file in Step 2. To use this file, you can use the IFS download function in IBM Navigator for i to copy the file to the Kerberos server and run it.

Follow these steps to use the batch files to add principal names to the Kerberos server:

Download the batch files created by the wizard to your Kerberos server.

As the administrator on your Windows server do the following:

- a) In IBM Navigator for i on System A, expand **IBM i Management > File Systems > Integrated File System > Root > QIBM > UserData > OS400 > iSeriesNavigator > config**
- b) Right-click **NASConfig_systema.bat** and select **Download**.
- c) Click the **Download** button on the Confirm Download page.
- d) Save the file, this will put it in your browser's download location. Refer to your browser's documentation for how to customize the download folder location. Usually this is the **Downloads** folder.

Note: It is recommended that you now delete the **NASConfig_systema.bat** file from System A.

- e) Repeat these steps on System B to download **NASConfig_systemb.bat** to the Windows server.

Run both batch files on kdc1.myco.com

1. On your Windows server, open the directory where you downloaded the batch files.
2. Find the **NASConfig_systema.bat** file and double click the file to run it.
3. Repeat these steps for **NASConfig_systemb.bat**.
4. After each file runs, verify that the IBM i principal has been added to the Kerberos server by completing the following:
 - a. On your Windows server, expand **Administrative Tools > Active Directory Users and Computers > Users**.
 - b. Verify the IBM i has a user account by selecting the appropriate Windows domain.

Note: This Windows domain should be the same as the default realm name that you specified in the network authentication service configuration.

- c. In the list of users that is displayed, find **systema_1_krbsvr400** and **systemb_1_krbsvr400**. These are the user accounts generated for the IBM i principal name.
- d. (Optional) Access the properties on your Active Directory user. From the **Delegation** tab, select **Trust this user for delegation to any service (Kerberos only)**.

Note: This optional step enables your system to delegate, or forward, a user's credentials to other systems. As a result, the IBM i service principal can access services on multiple systems on behalf of the user. This is useful in a multi-tier network.

Now that you have added the IBM i service principals to the Kerberos server, you can create user profiles on the IBM i.

Creating user profiles on System A and System B

You want all of your users in the MYCO.COM Kerberos registry to map to a single IBM i user profile on each of your IBM i systems.

Therefore, you need to create an IBM i user profile on System A and System B. Use the information from your work sheets to create a user profile for these users:

1. In IBM Navigator for i on System A, expand **IBM i Management > User and Groups**.
2. Click **Users**.
3. On **Actions** pull-down, select **New > User**.
4. On the **New User** dialog box, enter SYSUSERA in the **User name** field.
5. In the **Password** field, select **No password (sign-on not allowed)**.
6. Click **Capabilities**.
7. On the **Privileges** page, select **User** in the **Privilege class** field. Click **OK** and click **Add**.

Repeat these steps on System B, but enter SYSUSERB in the **User name** field.

Now that you have created the user profiles on System A and System B, you can create the home directories for all of the IBM i user profiles.

Creating home directories on System A and System B

Each user that connects to a IBM i and applications needs a directory in the /home directory. This directory stores the user's Kerberos credentials cache.

To create a home directory for a user, complete the following:

On the System A command line, enter: `CRTDIR '/home/user profile'` where `user profile` is the IBM i user profile name for the user. For example: `CRTDIR '/home/SYSUSERA'`. This creates a home directory for the user profile on System A that represents all the Active Directory users.

Repeat this command on System B but specify SYSUSERB to create a home directory for the user profile on System B.

Now that you have created the home directories, you can test the network authentication service configuration on the systems.

Testing network authentication service on System A and System B

After you complete the network authentication service configuration tasks for both of your systems, you need to verify that your configurations work correctly for both System A and System B.

You can do this testing by completing these steps to request a ticket granting ticket for the System A and System B principals:

Note: Ensure that you have created a home directory for your IBM i user profile before performing this procedure.

1. On a command line, enter QSH to start the Qshell Interpreter.
2. Enter `keytab list` to display a list of principals registered in the keytab file. In this scenario, `krbsvr400/systema.myco.com@MYCO.COM` should display as the principal name for System A.
3. Enter `kinit -k krbsvr400/systema.myco.com@MYCO.COM` to request a ticket-granting ticket from the Kerberos server. By running this command, you can verify that your IBM i has been configured properly and that the password in the keytab file matches the password stored on the Kerberos server. If this is successful then the `kinit` command will display without errors.
4. Enter `klist` to verify that the default principal is `krbsvr400/iseriesa.myco.com@MYCO.COM`. This command displays the contents of a Kerberos credentials cache and verifies that a valid ticket has been created for the IBM i service principal and placed within the credentials cache on the system.


```
Ticket cache: FILE:/QIBM/USERDATA/OS400/NETWORKAUTHENTICATION/creds/krbcred
Default principal: krbsvr400/systema.myco.com@MYCO.COM
Server: krbtgt/MYCO.COM@MYCO.COM
Valid 200X/06/09-12:08:45 to 20XX/11/05-03:08:45
$
```

Repeat these steps using the service principal name for System B: krbsvr400/systemb.myco.com@MYCO.COM

Now that you have tested network authentication service on System A and System B, you can create an EIM identifier for each of the administrators.

Creating EIM identifiers for two administrators, John Day and Sharon Jones

In this scenario, you create two EIM identifiers, one named John Day and the other named Sharon Jones.

As part of setting up your single sign-on test environment, you need to create EIM identifiers for two of your administrators so they can both log on to IBM i environments using their Windows user identities.

To create the EIM identifiers, follow these steps:

1. In IBM Navigator for i on System A, expand **IBM i Management > Network > All Tasks > Enterprise Identity Mapping**.
2. Click **Domain Management**.
3. Right-click **MyCoEimDomain** and select **Open**.

Note: You might be prompted to connect to the domain controller. In that case, the **Connect to EIM Domain Controller** dialog box is displayed. You must connect to the domain before you can perform actions in it. To connect to the domain controller, provide the following information and click **OK**:

- **User type:** Distinguished name
- **Distinguished name:** cn=administrator
- **Password:** mycopwd

Note: Any and all passwords specified in this scenario are for example purposes only. To prevent a compromise to your system or network security, you should never use these passwords as part of your own configuration.

4. Right-click **Identifiers** and select **New Identifier**.
5. On the **New EIM Identifier** dialog box, enter John Day in the **Identifier** field.
6. Click **OK**.

Repeat steps 2 through 6, but enter Sharon Jones in the **Identifier** field.

Now that you have created an EIM identifier for each of the administrators, you must create identifier associations that map user identities to the identifiers. First, create the identifier associations for John Day.

Creating identifier associations for John Day

You must create the appropriate associations between the EIM identifier, John Day, and the user identities that the person represented by the identifier uses. These identifier associations, when properly configured, enable the user to participate in a single sign-on environment.

In this scenario, you need to create one source association and two target associations for the John Day identifier:

- A source association for the jday Kerberos principal, which is the user identity that John Day, the person, uses to log in to Windows and the network. The source association allows the Kerberos principal to be mapped to another user identity as defined in a corresponding target association.

- A target association for the JOHND IBM i user profile, which is the user identity that John Day, the person, uses to log in to IBM i and to other IBM i applications on System A. The target association specifies that a mapping lookup operation can map to this user identity from another one as defined in a source association for the same identifier.
- A target association for the DAYJO IBM i user profile, which is the user identity that John Day, the person, uses to log in to IBM Navigator for i and other IBM i applications on System B. The target association specifies that a mapping lookup operation can map to this user identity from another one as defined in a source association for the same identifier.

Use the information from your planning work sheets to create the associations.

To create the source association for John Day's Kerberos principal, follow these steps:

1. In IBM Navigator for i on System A, expand **IBM i Management > Network > All Tasks > Enterprise Identity Mapping**.
2. Click **Domain Management**.
3. Right-click **MyCoEimDomain** and select **Open**.

Note: You might be prompted to connect to the domain controller. In that case, the **Connect to EIM Domain Controller** dialog box is displayed. You must connect to the domain before you can perform actions in it. To connect to the domain controller, provide the following information and click **OK**:

- **User type:** Distinguished name
- **Distinguished name:** cn=administrator
- **Password:** mycopwd

Note: Any and all passwords specified in this scenario are for example purposes only. To prevent a compromise to your system or network security, you should never use these passwords as part of your own configuration.

4. Right-click **Identifiers** and select **Open**.
5. Right-click **John Day** and select **Properties**.
6. On the **Associations** page, click **Add**.
7. In the **Add Association** dialog box, specify or **Browse** to select the following information, and click **OK**.
 - **Registry:** MYCO.COM
 - **User:** jday
 - **Association type:** Source
8. Click **OK** to close the **Add Associations** dialog box.

To create a target association for John Day's IBM i user profile on System A, follow these steps:

1. On the **Associations** page, click **Add**.
2. In the **Add Association** dialog box, specify or **Browse** to select the following information, and click **OK**:
 - **Registry:** SYSTEMA.MYCO.COM
 - **User:** JOHND
 - **Association type:** Target
3. Click **OK** to close the **Add Associations** dialog box.

To create a target association for John Day's IBM i user profile on System B, follow these steps:

1. On the **Associations** page, click **Add**.
2. In the **Add Association** dialog box, specify or **Browse** to select the following information, and click **OK**:
 - **Registry:** SYSTEMB.MYCO.COM
 - **User:** DAYJO
 - **Association type:** Target

3. Click **OK** to close the **Add Associations** dialog box.

4. Click **OK** to close the **Properties** dialog box.

Now that you have created the identifier associations that map John Day's user identities to his EIM identifier, you can create similar associations for Sharon Jones.

Creating identifier associations for Sharon Jones

You must create the appropriate associations between the EIM identifier, Sharon Jones, and the user identities that the person represented by the identifier uses. These associations, when properly configured, enable the user to participate in a single sign-on environment.

In this scenario, you need to create one source association and two target associations for the Sharon Jones identifier:

- A source association for the sjones Kerberos principal, which is the user identity that Sharon Jones, the person, uses to log in to Windows and the network. The source association allows the Kerberos principal to be mapped to another user identity as defined in a corresponding target association.
- A target association for the SHARONJ IBM i user profile, which is the user identity that Sharon Jones, the person, uses to log in to IBM Navigator for i and other IBM i applications on System A. The target association specifies that a mapping lookup operation can map to this user identity from another one as defined in a source association for the same identifier.
- A target association for the JONESSH IBM i user profile, which is the user identity that Sharon Jones, the person, uses to log in to IBM Navigator for i and other IBM i applications on System B. The target association specifies that a mapping lookup operation can map to this user identity from another one as defined in a source association for the same identifier.

Use the information from your planning work sheets to create the associations:

To create the source association for Sharon Jones' Kerberos principal, follow these steps:

1. In IBM Navigator for i on System A, expand **IBM i Management > Network > All Tasks > Enterprise Identity Mapping**.
2. Click **Domain Management**.
3. Right-click **MyCoEimDomain** and select **Open**.

Note: You might be prompted to connect to the domain controller. In that case, the **Connect to EIM Domain Controller** dialog box is displayed. You must connect to the domain before you can perform actions in it. To connect to the domain controller, provide the following information and click **OK**:

- **User type:** Distinguished name
- **Distinguished name:** cn=administrator
- **Password:** mycopwd

Note: Any and all passwords specified in this scenario are for example purposes only. To prevent a compromise to your system or network security, you should never use these passwords as part of your own configuration.

4. Right-click **Identifiers** and select **Open**.
5. Right-click **Sharon Jones** and select **Properties**.
6. On the **Associations** page, click **Add**.
7. On the **Add Association** dialog box, specify or **Browse** to select the following information, and click **OK**.

- **Registry:** MYCO.COM
- **User:** sjones
- **Association type:** Source

8. Click **OK** to close the **Add Associations** dialog box.

To create a target association to Sharon Jones' IBM i user profile on System A, follow these steps:

1. On the **Associations** page, click **Add**.
2. On the **Add Association** dialog box, specify or **Browse** to select the following information, and click **OK**:
 - **Registry:** SYSTEMA.MYCO.COM
 - **User:** SHARONJ
 - **Association type:** Target

3. Click **OK** to close the **Add Associations** dialog box.

To create a target association to Sharon Jones' IBM i user profile on System B, follow these steps:

4. On the **Associations** page, click **Add**.
5. On the **Add Association** dialog box, specify or **Browse** to select the following information, and click **OK**:
 - **Registry:** SYSTEMB.MYCO.COM
 - **User:** JONSSH
 - **Association type:** Target
6. Click **OK** to close the **Add Associations** dialog box.
7. Click **OK** to close the **Properties** dialog box.

Now that you have created the identifier associations that map Sharon Jones' user identities to her EIM identifier, you can create the default registry policy associations that map all of your Kerberos registry users to a specific user profile in each of the IBM i user registries.

Creating default registry policy associations

You want to have all your Microsoft Active Directory users on the Windows server map to the user profile, SYSUSERA, on System A and to the user profile, SYSUSERB, on System B.

Fortunately, you can use policy associations to create mappings directly between a group of users and a single target user identity. In this case, you can create a default registry policy association that maps all the user identities (for which no identifier associations exist) in the MYCO.COM Kerberos registry to a single IBM i user profile on System A.

You need two policy associations to accomplish this goal. Each policy association uses the MYCO.COM user registry definition as the source of the association. However, each policy association maps user identities in this registry to different target user identities, depending on which IBM i the Kerberos user accesses:

- One policy association maps the Kerberos principals in the MYCO.COM user registry to a target user of SYSUSERA in the target registry of SYSTEMA.MYCO.COM.
- The other policy association maps the Kerberos principals in the MYCO.COM user registry to a target user of SYSUSERB in the target registry of SYSTEMB.MYCO.COM.

Use the information from your planning works sheets to create two default registry policy associations.

Note: Before you can use policy associations, however, you must first ensure that you enable the domain to use policy associations for mapping lookup operations. You can do this as part of the process for creating your policy associations, as follows:

1. In IBM Navigator for i on System A, expand **IBM i Management > Network > All Tasks > Enterprise Identity Mapping**.
2. Click **Domain Management**.
3. Right-click **MyCoEimDomain**, and select **Mapping policy**.
4. On the **General** page, select the **Enable mapping lookups using policy associations for domain MyCoEimDomain**.

Follow these steps to create the default registry policy association for the users to map to the SYSUSERA user profile on System A:

1. On the **Registry** page, click **Add**.
2. In the **Add Default Registry Policy Association** dialog box, specify or **Browse** to select the following information, and click **OK**:
 - **Source registry:** MYCO.COM
 - **Target registry:** SYSTEMA.MYCO.COM
 - **Target user:** SYSUSERA
3. Click **OK** to close the **Mapping Policy** dialog box.

Follow these steps to create the default registry policy association for the users to map to the SYSUSERB user profile on System B:
4. On the **Registry** page, click **Add**.
5. In the **Add Default Registry Policy Association** dialog box, specify or **Browse** to select the following information, and click **OK**:
 - **Source registry:** MYCO.COM
 - **Target registry:** SYSTEMB.MYCO.COM
 - **Target user:** SYSUSERB
6. Click **OK** to close the **Mapping Policy** dialog box.

Now that you have created the default registry policy associations, you can enable the registries to participate in lookup operations and to use the policy associations.

Enabling registries to participate in lookup operations and to use policy associations

EIM allows you to control how each registry participates in EIM. Because a policy association can have a large scale effect within an enterprise, you can control whether a registry can be affected by policy associations.

Also, you can control whether a registry can participate in mapping lookup operations at all. To use policy associations for a registry, you must enable their use for that registry as well as enable that registry to participate in lookup operations. To enable registries to use policy associations and participate in lookup operations, complete these steps:

To enable the MYCO.COM registry to participate in mapping lookup operations, follow these steps:

1. In IBM Navigator for i on System A, expand **IBM i Management > Network > All Tasks > Enterprise Identity Mapping**.
2. Click **Domain Management**.
3. Right-click **MyCoEimDomain** and select **Open**.

Note: You might be prompted to connect to the domain controller. In that case, the **Connect to EIM Domain Controller** dialog box is displayed. You must connect to the domain before you can perform actions in it. To connect to the domain controller, provide the following information and click **OK**:

- **User type:** Distinguished name
- **Distinguished name:** cn=administrator
- **Password:** mycopwd

Note: Any and all passwords specified in this scenario are for example purposes only. To prevent a compromise to your system or network security, you should never use these passwords as part of your own configuration.

4. Right-click **User Registries** and select **Open**.
5. Right-click the **MYCO.COM** registry and select **Mapping Policy**.
6. On the **General** page, select **Enable mapping lookups for registry MYCO.COM**, and click **OK**.

To enable the SYSTEMA.MYCO.COM registry to participate in mapping lookup operations and to use policy associations, follow these steps:

1. In IBM Navigator for i on System A, expand **IBM i Management > Network > All Tasks > Enterprise Identity Mapping**
2. Click **Domain Management**.
3. Right-click **MyCoEimDomain** and select **Open**.
4. Right-click **User Registries** and select **Open**.
5. Right-click the **SYSTEMA.MYCO.COM** registry and select **Mapping Policy**.
6. On the **General** page, select **Enable mapping lookups for registry SYSTEMA.MYCO.COM**, select **Use policy associations**, and click **OK**.

Repeat these steps to enable the SYSTEMB.MYCO.COM registry to participate in mapping lookup operations and to use policy associations, but on the **General** page, select **Enable mapping lookups for registry SYSTEMB.MYCO.COM**, select **Use policy associations**, and click **OK**.

Now that you have completed the EIM configuration for your registries and users, you should test the resulting mappings to ensure that they work as planned.

Testing EIM identity mappings

Now that you have created all the associations that you need, you must verify that EIM mapping lookup operations return the correct results based on the configured associations.

For this scenario, you must test the mappings used for the identifier associations for each of the administrators and you must test the mappings used for the default registry policy associations. To test the EIM mappings, follow these steps:

Test mappings for John Day

To test that identifier mappings work as expected for John Day, follow these steps:

1. In IBM Navigator for i on System A, expand **IBM i Management > Network > All Tasks > Enterprise Identity Mapping**.
2. Click **Domain Management**.
3. Right-click **MyCoEimDomain** and select **Test a mapping**.

Note: You might be prompted to connect to the domain controller. In that case, the **Connect to EIM Domain Controller** dialog box is displayed. You must connect to the domain before you can perform actions in it. To connect to the domain controller, provide the following information and click **OK**:

- **User type:** Distinguished name
- **Distinguished name:** cn=administrator
- **Password:** mycopwd

Note: Any and all passwords specified in this scenario are for example purposes only. To prevent a compromise to your system or network security, you should never use these passwords as part of your own configuration.

4. On the **Test a mapping** dialog box, specify or **Browse** to select the following information, and click **Test**.
 - **Source registry:** MYCO.COM
 - **Source user:** jday
 - **Target registry:** SYSTEMA.MYCO.COM
5. Results will display in the **Mapping found** portion of the page, as follows:

For these fields	See these results
Target user	JOHND

For these fields	See these results
Origin	EIM Identifier: John Day

6. Click **Close**.

Repeat these steps but select SYTEMB.MYCO.COM for the **Target registry** field. Results will display in the **Mapping found** portion of the page, as follows:

For these fields	See these results
Target user	DAYJO
Origin	EIM Identifier: John Day

Test mappings for Sharon Jones

To test the mappings used for the individual associations for Sharon Jones, follow these steps:

1. In IBM Navigator for i on System A, expand **IBM i Management > Network > All Tasks > Enterprise Identity Mapping**.
2. Click **Domain Management**.
3. Right-click **MyCoEimDomain** and select **Test a mapping**.

Note: You might be prompted to connect to the domain controller. In that case, the **Connect to EIM Domain Controller** dialog box is displayed. You must connect to the domain before you can perform actions in it. To connect to the domain controller, provide the following information and click **OK**:

- **User type:** Distinguished name
- **Distinguished name:** cn=administrator
- **Password:** mycopwd

Note: Any and all passwords specified in this scenario are for example purposes only. To prevent a compromise to your system or network security, you should never use these passwords as part of your own configuration.

4. On the **Test a mapping** dialog box, specify or **Browse** to select the following information, and click **Test**:
 - **Source registry:** MYCO.COM
 - **Source user:** sjones
 - **Target registry:** SYSTEMA.MYCO.COM
5. Results will display in the **Mapping found** portion of the page, as follows:

For these fields	See these results
Target user	SHARONJ
Origin	EIM Identifier: Sharon Jones

6. Click **Close**.

Repeat these steps but select SYSTEMB.MYCO.COM for the **Target registry** field. Results will display in the **Mapping found** portion of the page, as follows:

For these fields	See these results
Target user	JONESSH
Origin	EIM Identifier: Sharon Jones

Test mappings used for default registry policy associations

To test that mappings work as expected for the users in the Order Receiving Department, as based on the policy associations that you defined, follow these steps:

1. In IBM Navigator for i on System A, expand **IBM i Management > Network > All Tasks > Enterprise Identity Mapping**.
2. Click **Domain Management**.
3. Right-click **MyCoEimDomain** and select **Test a mapping**.

Note: You might be prompted to connect to the domain controller. In that case, the **Connect to EIM Domain Controller** dialog box is displayed. You must connect to the domain before you can perform actions in it. To connect to the domain controller, provide the following information and click **OK**:

- **User type:** Distinguished name
- **Distinguished name:** cn=administrator
- **Password:** mycopwd

Note: Any and all passwords specified in this scenario are for example purposes only. To prevent a compromise to your system or network security, you should never use these passwords as part of your own configuration.

4. On the **Test a mapping** dialog box, specify or **Browse** to select the following information, and click **Test**:
 - **Source registry:** MYCO.COM
 - **Source user:** mmiller
 - **Target registry:** SYSTEMA.MYCO.COM
5. Results will display in the **Mapping found** portion of the page, as follows:

For these fields	See these results
Target user	SYSUSERA
Origin	Registry policy association

6. Click **Close**.

To test the mappings used for the default registry policy association that maps your users to the SYSUSERB profile on System B, follow these steps:

1. In IBM Navigator for i on System A, expand **IBM i Management > Network > All Tasks > Enterprise Identity Mapping**.
2. Click **Domain Management**.
3. Right-click **MyCoEimDomain** and select **Test a mapping**.

Note: You might be prompted to connect to the domain controller. In that case, the **Connect to EIM Domain Controller** dialog box is displayed. You must connect to the domain before you can perform actions in it. To connect to the domain controller, provide the following information and click **OK**:

- **User type:** Distinguished name
- **Distinguished name:** cn=administrator
- **Password:** mycopwd

Note: Any and all passwords specified in this scenario are for example purposes only. To prevent a compromise to your system or network security, you should never use these passwords as part of your own configuration.

4. On the **Test a mapping** dialog box, specify or **Browse** to select the following information, and click **Test**:
 - **Source registry:** MYCO.COM
 - **Source user:** ksmith
 - **Target registry:** SYSTEMB.MYCO.COM
5. Results will display in the **Mapping found** portion of the page, as follows:

For these fields	See these results
Target user	SYSUSERB
Origin	Registry policy association

6. Click **Close**.

If you receive messages or errors that indicate problems with your mappings or with communications, see [Troubleshoot EIM](#) to help you find solutions to these problems.

Now that you have tested the EIM identity mappings, you can configure IBM i Access for Windows applications to use Kerberos authentication.

Configuring IBM i Access Client Solutions applications to use Kerberos authentication

You must use Kerberos to authenticate before you can use IBM i Access Client Solutions applications to access your system. Therefore, from your PC, you need to configure IBM i Access Client Solutions to use Kerberos authentication.

To configure IBM i Access Client Solutions applications to use Kerberos authentication, complete the following steps:

Note: Each of your users needs to perform all of these steps on their own PC.

1. Log on to the Windows domain by signing in to your PC.
2. In IBM i Access Client Solutions on your PC, select **Actions > Management > System Configurations**.
3. On the **System Configuration** page, select **System A** and click **Edit**.
4. On the **Connection** tab, select **Use kerberos authentication; do not prompt**. Click **OK**. This will allow IBM i Access Client Solutions connections to use the Kerberos principal name and password for authentication.
5. On the System Configuration page, click **Close**.
6. Repeat these steps for System B.

Now that you have configured IBM i Access Client Solutions applications to use Kerberos authentication, you can verify the single sign-on environment.

Verifying network authentication service and EIM configuration

Now that you have verified the individual pieces of your single sign-on configuration and ensured that all setup is complete, you must verify that you have configured EIM and network authentication service correctly and that single sign-on works as expected.

Note: When using the 5250 emulator in IBM i Access Client Solutions with Kerberos Authentication, you need to change the **Remote sign-on (QRMTSIGN)** system value to *VERIFY to enable you to bypass the sign-on. To change the **Remote sign-on** system value, follow these steps:

1. In IBM Navigator for i on System A, expand **IBM i Management > Configuration and Service**.
2. Click **System Values**.
3. Right-click **Signon** and select **Properties**.
4. On the Remote page, select **Allow sign-on to be bypassed** and **Verify user ID on target system**, and click **OK**.
5. Repeat these steps on System B.

Verify that your single sign-on environment works correctly.

Have John Day follow these steps:

1. In IBM i Access Client Solutions,
 - a) On the **System** pull-down, select **System A**.

- b) Expand **General** and click **5250 Emulator** to open a connection to System A.
2. An emulator session is started for System A and no sign-on prompt displays. To verify the session is signed on as JOHND, John Day's IBM i user profile, enter the **DSPJOB** command in the emulator session and check that the **USER:** field shows JOHND.

Note: IBM i Access Client Solutions 5250 emulator session successfully used EIM to map the jday Kerberos principal to the JOHND System A user profile because of the associations defined for EIM identifier, John Day. The emulator session for System A is now connected as JOHND.

Have Sharon Jones follow these steps:

1. In IBM i Access Client Solutions,
 - a. On the **System** pull-down, select **System A**.
 - b. Expand **General** and click **5250 Emulator** to open a connection to System A.
2. An emulator session is started for System A and no sign-on prompt displays. To verify the session is signed on as SHARONJ, Sharon Jones' IBM i user profile, enter the **DSPJOB** command in the emulator session and check that the **USER:** field shows SHARONJ.

Note: IBM i Access Client Solutions 5250 emulator session successfully used EIM to map the sjones Kerberos principal to the SHARONJ System A user profile because of the associations defined for EIM identifier, Sharon Jones. The emulator session for System A is now connected as SHARONJ.

(Optional) Postconfiguration considerations

Now that you finished this scenario, the only EIM user you have defined that EIM can use is the DN for the LDAP administrator.

The LDAP administrator DN that you specified for the system user on System A has a high level of authority to all data on the directory server. Therefore, you might consider creating one or more DNs as additional users that have more appropriate and limited access control for EIM data. The number of additional EIM users that you define depends on your security policy's emphasis on the separation of security duties and responsibilities. Typically, you might create at least the two following types of DNs:

- **A user that has EIM administrator access control**

This EIM administrator DN provides the appropriate level of authority for an administrator who is responsible for managing the EIM domain. This EIM administrator DN can be used to connect to the domain controller when managing all aspects of the EIM domain by means of IBM Navigator for i.

- **At least one user that has all of the following access controls:**

- Identifier administrator
- Registry administrator
- EIM mapping operations

This user provides the appropriate level of access control required for the system user that performs EIM operations on behalf of the operating system.

Note: To use this new DN for the system user instead of the LDAP administrator DN, you must change the EIM configuration properties for each system. For this scenario, you need to change the EIM configuration properties for any IBM i that you set up.

Scenario: Enabling single sign-on for ISV applications

View this information to review scenarios that illustrate typical single sign-on implementation situations to help you plan your own certificate implementation as part of your server security policy.

Situation

You are the lead application developer for an independent software vendor (ISV), and are responsible for overseeing the applications that your company develops and delivers to IBM i Access Client Solutions customers. You know that IBM i Access Client Solutions provides your customers with the capability

of creating and participating in a single sign-on environment. You want your applications to leverage these single sign-on capabilities because you feel it will help sell your product. You decide to market an application called **Calendar** to IBM i Access Client Solutions customers that use network authentication service and Enterprise Identity Mapping (EIM) to create their single sign-on environment. The **Calendar** application allows users to view and manage their workday schedule. Enabling the **Calendar** application for single sign-on requires you to include server specific code within your application which enables it to participate within a single sign-on environment. You have previous experience creating applications that call EIM APIs, but this will be your first time working with an application that also calls network authentication service APIs.

Note: It is also possible to develop applications for a single sign-on environment that use a different authentication method. For example, you can insert the necessary code for authenticating with digital certificates, or for binding the directory server, instead of inserting the necessary code for authenticating with network authentication service.

Objectives

You want to be able to market your **Calendar** application to IBM i Access Client Solutions customers who are interested in applications that are capable of participating in a single sign-on environment. You want to enable the server side of the **Calendar** application to participate in a single sign-on environment. You have the following objectives, as you complete this scenario:

- You want to change the server specific part of an existing **Calendar** application or develop a new **Calendar** application which participates in a single sign-on environment that uses EIM and network authentication service.
- You want to create a single sign-on environment in which you can test your application.
- You want to test your **Calendar** application and ensure that it successfully participates in a single sign-on environment.

Prerequisites and assumptions

Implementation of this scenario depends on the following assumptions and prerequisite conditions:

- You want your **Calendar** application to participate in a single sign-on environment that is configured to use Kerberos and EIM.
- You already have experience creating applications for the IBM i Access Client Solutions platform.
- You have configured your IBM i system to participate in a Kerberos realm.
- You write applications in one of the following languages:
 - You use an ILE programming language, such as C, to write your applications and you are familiar with the GSS API set.
 - You use Java to write your applications and you are familiar with the JGSS API set.

Note: You might also require the Java toolbox, depending on which set of JGSS APIs you use.

- You have already completed the client-specific portion of your application, enabling it to use Kerberos authentication.

Configuration steps

Related information

[Programming](#)

[Generic Security Service API](#)

[IBM® Java Generic Security Service \(JGSS\)](#)

Completing the planning prerequisite worksheet

Complete the following planning worksheet to ensure that you have met the prerequisites for a successful single sign-on environment in which you can test your application.

Prerequisite worksheet	Answers
Do you have *SECADM, *ALLOBJ, and *IOSYSCFG special authorities?	Yes
Do you have one of the following servers acting as the Kerberos server? If yes, specify which one. 1. Microsoft Windows server Server 2. IBM i PASE 3. AIX server 4. z/OS	Yes
For Windows server Server, do you have Windows Support Tools (which provides the ktpass tool) installed?	Yes
Are all of the PCs that you want to be able to participate in a single sign-on environment in your network configured in an IBM i domain?	Yes
Have you applied the latest program temporary fixes (PTFs)?	Yes
Is the IBM i time within 5 minutes of the system time on the Kerberos server? If not see, Synchronize system times .	Yes

Writing a new application or change an existing application

You are ready to begin including the server specific code that enables your **Calendar** application to participate in an single sign-on environment.

Using your previous programming experience with EIM APIs, you create a program flow similar to this one:

- Application Initialization
 - EIM Get Handle
 - EIM Connect
- Processing Loop
 - Wait for user request
 - Authenticate user using Kerberos
 - Call EIM to map from network authentication service user to Local user
 - Swap to local user
 - Perform Task
 - Swap back to original user
 - Go to "Wait for user request"

Note: This scenario assumes that you have already created or changed the client specific code to enable your application for an IBM i single sign-on environment, and therefore only provides the steps required to complete the server specific part of your program.

- Application Termination
 - Destroy EIM Handle

See the [ISV code examples](#) for example pseudocode and snippets that you can use to help complete the server specific part of your program. When you have added the necessary client and server specific code to your **Calendar** application, you can create a single sign-on test environment to test it.

Creating a single sign-on test environment

To create a test environment for single sign-on you must complete a different scenario before you can complete this scenario.

Complete the [Scenario: Create a single sign-on test environment](#). This scenario demonstrates how to configure network authentication service and EIM to create a basic single sign-on test environment. This scenario guides you through the following steps to configure and work with a simple single sign-on environment:

1. Complete necessary planning work sheets.
2. Create a basic single sign-on configuration for the IBM i system.
3. Add the IBM i service principal to the Kerberos server.
4. Create a home directory for a test user, John Day, on the IBM i system.
5. Test the network authentication service configuration on the IBM i system.
6. Create an EIM identifier for John Day.
7. Create a source association and a target association for the new EIM identifier.
8. Test the EIM identity mappings.
9. Configure IBM i Access Client Solutions applications to use Kerberos.
10. Verify network authentication service and EIM configuration.

After you have created the single sign-on test environment the scenario describes, you can test your **Calendar** application to ensure that it works correctly.

Testing your application

You have completed the development of both client and server specific updates to your **Calendar** application, enabling it for an IBM i single sign-on environment. You are now ready to test it.

Follow these steps to verify that you have created an application that participates successfully in a single signon environment:

1. Log the test user jday (this user was created in the create a single sign-on test environment scenario) into the Windows domain by signing him into a PC.
2. Have the test user open your **Calendar** application on the PC. If the calendar opens, the application has used EIM to map the jday Kerberos principal to the JOHND IBM i user profile because of the associations defined for EIM identifier, John Day. The **Calendar** application session for the IBM i is now connected as JOHND, and you have successfully enabled your ISV application for an IBM i single sign-on environment.

Related concepts

[Scenario: Creating a single sign-on test environment](#)

In this scenario, you want to configure network authentication service and EIM to create a basic single sign-on test environment. Use this scenario to gain a basic understanding of what configuring a single sign-on environment involves on a small scale before implementing single sign-on across an entire enterprise.

Example: ISV code

This information displays sample code for writing a kerberos server along with calling EIM apis to map from a kerberos principal to an IBM i user profile.

IBM grants you a nonexclusive copyright license to use all programming code examples from which you can generate similar function tailored to your own specific needs.

All sample code is provided by IBM for illustrative purposes only. These examples have not been thoroughly tested under all conditions. IBM, therefore, cannot guarantee or imply reliability, serviceability, or function of these programs.

All programs contained herein are provided to you "AS IS" without any warranties of any kind. The implied warranties of non-infringement, merchantability and fitness for a particular purpose are expressly disclaimed.

Note: By using the code examples, you agree to the terms of the [“Code license and disclaimer information”](#) on page 66.

```

/**** START OF SPECIFICATIONS *****/
/*
/* MODULE NAME: Kerberos/EIM server sample
/*
/* DESCRIPTION: Below is sample code for writing a Kerberos server
/* along with calling EIM APIs to map from a Kerberos
/* principal to an IBM i user profile.
/*
/* NOTE: Error checking has been removed.
/*
/*****/

/* #include files removed here */

//-----
// EIM assumptions:
// On the IBM i where this program is running the EIM configuration
// information has been set. The information used by this program
// is:
// - ldapURL
// - local registry
// EIM ldap lookup connection
// - The ldap connection information needed for doing the mapping
// lookups in this program can be stored in a validation list
// or other user secure space. Here we will just hard code
// pretend values.
// - This connection will only be used for a lookup operation so
// the ldap user only needs EIM mapping lookup authority.
// All EIM data (Identifiers and associations) has been added.
//-----

#define LDAP_BINDDN "cn=mydummy"
#define LDAP_BINDPW "special"

//-----
//
// Function: l_eimError
// Purpose: EIM error has occurred. This function will print out the
// EIM error message.
//-----
void l_eimError(char * function, EimRC * err)
{
    char * msg = NULL;
    printf("EIM ERROR for function = %s.\n", function);
    msg = eimErr2String(err);
    printf(" %s\n",msg);
    free(msg);
}

//-----
//
// Function: l_eimConnect
// Purpose: Get an EIM handle and connect to the ldap server.
//-----
int l_eimConnect(EimHandle * handle)
{
    int rc = 0;
    char eimerr[150];
    EimRC *err = (EimRC *)&eimerr

```

```

EimConnectInfo con;

/* This needs to be at least 48. */
err->memoryProvidedByCaller = 150;

//-----
// Create handle. We will pass NULL for the URL indicating that we
// will use the information that was configured for the system.
//-----
eimCreateHandle(handle,
                NULL,
                err);

//-----
// Connect
//-----
// The ldap user id and password might be stored in a validation
// list or other user secure space. Here we will just hard code
// pretend values.
// You can also choose to use Kerberos authentication when
// connecting to ldap. You will first need to verify your ldap
// server is set up to accept kerberos authentication.
//-----
// This connection will only be used for a lookup operation so the
// ldap user only needs EIM mapping lookup authority.
//-----
con.type = EIM_SIMPLE;
con.creds.simpleCreds.protect = EIM_PROTECT_NO;
con.creds.simpleCreds.bindDn = LDAP_BINDDN;
con.creds.simpleCreds.bindPw = LDAP_BINDPW;
con.ssl = NULL;
eimConnect(handle,
           con,
           err);

return 0;
}

//-----
//-----
//
// Function: getIBMiUser
// Purpose:  Get IBM i user associated with the kerberos user and exchange
//           to the user.
//
//-----
int getIBMiUser(EimHandle * handle,
               char * IBMiUser,
               gss_buffer_desc * client_name)
{
    char * principal;
    char * realm;
    char * atsign;

    //-----
    //
    // Get principal and realm from the kerberos client_name.
    //
    //-----
    // client_name.value contains string of principal@realm. Get
    // pointer to each piece.
    //-----
    principal = client_name->value;
    atsign = strchr(principal, '@');
    *atsign = 0x00; // NULL end the principal
    realm = atsign + 1; // Advance pointer to the realm

    //-----
    //
    // Call EIM to get the target user associated with the kerberos
    // source user. This sample application assumes that the
    // kerberos realm name is also the name of the EIM registry
    // defining this realm.
    //
    //-----
    listPtr = (EimList *)listBuff;
    for (i = 0; i < 2; i++)
    {
        if (0 != (rc =
                 eimGetTargetFromSource(handle,
                                       realm,

```

```

        principal,
        NULL,          // use configured
                      // local
                      // registry.
        NULL,
        listSize,
        listPtr,
        err))
    {
        l_eimError("eimGetTargetFromSource", err);
        return -1;
    }

    if (listPtr->bytesAvailable == listPtr->bytesReturned)
        break;
    else
    {
        listSize = listPtr->bytesAvailable;
        freeStorage = malloc(listSize);
        listPtr = (EimList *)freeStorage;
    }
}

// Check the number of entries found, if 0 no mapping exists
// otherwise extract user profile from buffer and cleanup
// storage

return 0;
}

/*****
/* Function Name: get_kerberos_credentials_for_server */
/* */
/* Descriptive Name: Basically this function finds the keytab entry */
/* for this server. It will use this to validate */
/* the tokens received. */
/* */
/* Input: char * service_name - the service name. */
/* gss_buffer_t msg_buf - the input message */
/* Output: gss_cred_id_t *server_creds - The output credential */
/* */
/* Exit Normal: return value == 0 */
/* Exit Error: -1, error was encountered, */
*****/
int get_kerberos_credentials_for_server (
    char * service_name, /* name of service principal*/
    gss_cred_id_t * server_creds) /* credential acquired */
{
    gss_buffer_desc name_buf; /* buffer for import name */
    gss_name_t server_name; /* gss service name */
    OM_uint32 maj_stat, /* GSS status code */
    min_stat; /* Mechanism kerberos status */

    /* Convert service name to GSS internal format */
    name_buf.value = service_name;
    name_buf.length = strlen((char *)name_buf.value) + 1;
    maj_stat = gss_import_name(
        &min_stat, /* kerberos status */
        &name_buf, /* name to convert */
        (gss_OID) gss_nt_service_name, /* name type */
        &server_name); /* GSS internal name */

    /* Acquire credentials for the service from keytab */
    maj_stat = gss_acquire_cred(
        &min_stat, /* kerberos status */
        server_name, /* gss internal name */
        GSS_C_INDEFINITE, /* max credential life */
        GSS_C_NULL_OID_SET, /* use default mechanism */
        GSS_C_ACCEPT, /* credential usage */
        server_creds, /* output cred handle */
        NULL, /* ignore actual mech */
        NULL); /* ignore time remaining */

    /* Release the gss internal format name */
    gss_release_name(&min_stat, &server_name);

    return 0;
}

/*****

```



```

/* Function Name: do_kerberos_authentication() */
/* Purpose: Any valid client request is accepted. If a context */
/* is established, its handle is returned in context and */
/* the client name is returned. */
/* */
/* Exit Normal: return value == 0 */
/* Exit Error: -1, error was encountered, */
/*****
int do_kerberos_authentication (
    int s, /* socket connection */
    gss_cred_id_t server_creds, /* credentials for the server */
    gss_ctx_id_t * context, /* GSS context */
    gss_buffer_t client_name) /* kerberos principal */
{
    gss_buffer_desc send_tok, /* token to send to client */
                  recv_tok; /* token received from client */
    gss_name_t client; /* client principal */
    OM_uint32 maj_stat, /* GSS status code */
             min_stat; /* Mechanism (kerberos) status*/
    msgDesc_t msgSend, /* Message buffer to send */
             msgRecv; /* Message buffer received */
    gss_OID doid;

    *context = GSS_C_NO_CONTEXT; /* initialize the context */

    do {
        /* Receive the message from the client */
        memset(&msgRecv, 0x00, sizeof(msgRecv));
        if (0 != recvAmessage(s, &msgRecv))
            return -1;
        recv_tok.length = msgRecv.dataLength;
        recv_tok.value = msgRecv.buffer;

        /* Accept the security context */
        maj_stat = gss_accept_sec_context(
            context, /* context handle */
            server_creds, /* acquired server creds*/
            &recv_tok, /* token received */
            GSS_C_NO_CHANNEL_BINDINGS, /* no CB */
            &client, /* client requestor */
            NULL, /* ignore mech type */
            &send_tok, /* token to be sent */
            NULL, /* ignore ctx flags */
            NULL, /* ignore time_rec */
            NULL); /* ignore delegated cred*/

        /* release the received token */
        gss_release_buffer(&min_stat, &recv_tok);

        /* Check to see if there is a token client wants mutual
           authentication. */
        if (send_tok.length != 0)
        {
            /* Send the token message to the other side */
            /* release the send token buffer */
        }
    } while (maj_stat == GSS_S_CONTINUE_NEEDED);

    /* client name is returned - extract client from ticket. This
       client name will be used to map to the IBM i user profile */
    maj_stat = gss_display_name(&min_stat, client, client_name, &doid);

    maj_stat = gss_release_name(&min_stat, &client);

    return 0;
}

/*****
/*
/* Function Name: getTestPort()
/*
/* Descriptive Name: get the port on which the server is listening
/*
/* Input: char * service - the service name. If null, looks
/* for kerb-test-server.
/*
/* Output: none
/*
/* Exit Normal: return value == port number
/*

```

```

/* Exit Error:  N/A                                     */
/*                                                     */
/*****
CLINKAGE int getTestPort(char *name)
{
    struct servent service;
    struct servent_data servdata;
    char defaultName[] = "krb-test-server", *servName;
    char tcp[] = "tcp";
    int retPort, rc;
    memset(&servdata, 0x00, sizeof(servdata));
    memset(&service, 0x00, sizeof(service));
    if (name == NULL)
        servName = defaultName;
    else
        servName = name;
    rc = getservbyname_r(servName, tcp, &service,
                        &servdata);
    if (rc != 0)
        retPort = DEFAULT_KERB_SERVER_PORT;
    else
        retPort = service.s_port;

    return ntohl(retPort);
}
/* end getPort                                     */

/*****
/*
/* Function Name:  getListeningSocket()
/*
/* Descriptive Name:  get a listening socket created and return it.
/*
/* Input:           none.
/*
/* Output:          listening socket created.
/*
/* Exit Normal:     return value == listening socket.
/*
/* Exit Error:      -1, error was encountered.
/*
/* NOTE: Error checking removed
/*
/*****
CLINKAGE int getListeningSocket(void)
{
    int rc, sd, option;
    struct sockaddr_in sin;

    sd = socket(AF_INET, SOCK_STREAM, 0)

    option = 1;

    setsockopt(sd, SOL_SOCKET, SO_REUSEADDR,
               (char *)&option, sizeof(option));

    memset(&sin, 0x00, sizeof(sin));
    sin.sin_family = AF_INET;
    sin.sin_port = htons(getTestPort(NULL));

    bind(sd, (struct sockaddr *)&sin, sizeof(sin));

    listen(sd, SOMAXCONN);

    return sd;
}
/* end getListeningSocket()                       */

/*****
/*
/* Function Name:  getServerSocket()
/*
/* Descriptive Name:  get a server socket that is connected to a
/*                   client. This routine blocks waiting for
/*                   the client.
/*
/* Input:          int lsd - listening socket.
/*
/* Output:          server socket created.
/*
/* Exit Normal:     return value == server socket.
/*
/*****

```

```

/* Exit Error:  -1, error was encountered.          */
/*                                                     */
/* NOTE: Error checking removed                      */
/*                                                     */
/*                                                     */
/*                                                     */
/*****
CLINKAGE int getServerSocket(int lsd)
{
    return accept(lsd, NULL, 0);
}
*/ end getServerSocket() */

/*****
/*
/* Function Name: main                               */
/*                                                     */
/* Descriptive Name: Driver for the server program which performs
/*                   kerberos authentication and EIM mapping.
/*                                                     */
/* Input:          char* service_name - name of service requested
/*                                                     */
/* Exit Normal:    0 = success
/*                                                     */
/* Exit Error:     -1, error was encountered.
/*                                                     */
/* NOTE: Error checking removed
/*                                                     */
/*                                                     */
/*****
int main(int argc, char **argv)
{
    int          ssd,          /* server socket          */
               lsd;          /* listening socket      */
    char         *service_name; /* name of service (input) */
    gss_cred_id_t server_creds; /* server credentials to acquire */
    gss_ctx_id_t context;      /* GSS context          */
    OM_uint32    maj_stat,     /* GSS status code      */
               min_stat;      /* Mechanism (kerberos) status */
    gss_buffer_desc client_name; /* Client principal establishing
                                   context.          */

    char IBMiUser[10];
    char save_handle[SY_PH_MAX_PRFHDL_LEN]; // *CURRENT profile handle
    char client_handle[SY_PH_MAX_PRFHDL_LEN]; // Swap to profile handle
    EimHandle    eimHandle;

    Qus_EC_t errorcode;
    memset(errorcode, 0x00, 256);
    errorcode->Bytes_Provided = 256;

    service_name = argv[1];

    /*-----
    // Kerberos setup
    // Acquire credentials for the service
    //-----*/
    get_kerberos_credentials_for_server(service_name, &server_creds);

    /*-----
    // get a listening socket
    //-----*/
    lsd = getListeningSocket();

    /*-----
    // EIM setup
    // Connect to eim
    //-----*/
    l_eimConnect(&eimHandle);

    /*-----
    // Save a copy of the current user so we can swap back to it
    // after each request
    //-----*/
    QsyGetProfileHandleNoPwd(save_handle,
                            " *CURRENT ",
                            " *NOPWD ",
                            &errorcode);

    /*-----
    // Loop waiting for requests on the socket
    //-----*/
    do { /* loop until the application or the system is ended
        /* Save the profile handle of the current user
    */

```

```

/* Accept a TCP connection                                     */
ssd = getServerSocket(lsd);

/* -----
// Establish context with the client and get the client name.
//-----
// The client name contains the kerberos principal and realm. In
// EIM these equate to the source user and source registry.
//----- */
do_kerberos_authentication(ssd,
                           server_creds,
                           &context,
                           &client_name);

/* -----
// Perform eim mapping lookup operation to get the associated
// IBM i user.
//----- */
getIBMiUser(&eimHandle,
            IBMiUser,
            &client_name);

/* -----
// Swap to the user returned from EIM lookup
// ----- */
QsyGetProfileHandleNoPwd(client_handle,
                        client_name,
                        "*NOPWDCHK ",
                        &errorcode);
QsySetToProfileHandle(client_handle, &errorcode);

/* -----
// do the real work of the application here as the application is
// now running under an appropriate user profile
// ----- */
// Call or code application specific behavior here.

/* -----
// reset the process to run under the original user profile
// ----- */
QsySetToProfileHandle(save_handle, &errorcode);

} while (1)

eimDestroy_handle(&eimHandle);

gss_delete_sec_context(&min_stat, &context, NULL);
close(ssd);
close(lsd);
gss_release_cred(&min_stat, &server_creds);
return 0;
}

```

Planning for single sign-on

The single sign-on planning process identifies the software and hardware prerequisites required to implement single sign-on in your enterprise.

You must plan carefully to create a single sign-on environment that meets the needs of your enterprise. There are several decisions that you must make while planning out an IBM i single sign-on environment. One such decision is if you want to create policy associations. The security concerns of your enterprise factor heavily on this type of decision.

Here are some resources that you can use to complete the planning stage for your single sign-on environment:

After you have adequately planned for your single sign-on environment, you can configure your single sign-on environment.

Related tasks

[Configuring single sign-on](#)

To configure a single sign-on environment you must use a compatible authentication method as your authentication method and Enterprise Identity Mapping (EIM) to create and manage your user profiles and identity mappings.

Related information

[Planning Enterprise Identity Mapping for IBM i](#)

Requirements for configuring a single sign-on environment

Your system must meet the following hardware and software prerequisites before implementing a single sign-on environment.

Requirements for IBM i

To create a successful single sign-on environment, ensure that all these requirements are met:

- Latest IBM i program temporary fixes (PTFs) are applied.
- IBM i Host Servers (5770-SS1 Option 12) is installed.
- Qshell Interpreter (5770-SS1 Option 30) is installed.
- TCP/IP and basic system security are configured.

Client PC requirements

To create a successful single sign-on environment, ensure that all these requirements are met:

- Microsoft Windows is used.
- IBM i Access Client Solutions (5733-XJ1) is installed.
- TCP/IP is configured.

Microsoft Windows server requirements

To create a successful single sign-on environment, ensure that all these requirements are met:

- Hardware planning and setup are completed.
- Windows server is used.
- Windows Support Tools (which provides the ktpass tool) is installed.
- TCP/IP is configured.
- Windows domain is configured.
- Users within the network are added to a Windows domain through Microsoft Windows Active Directory.

You can use the provided planning work sheets to help you gather information and make decisions for your single sign-on implementation. Each work sheet contains a list of tasks that need to be completed.

Single sign-on planning worksheets

Complete these worksheets to ensure that you have met all of the prerequisites for single sign-on and that you have considered all of the aspects of your particular system and its security requirements.

Before you use these configuration planning worksheets, you need to plan your overall single sign-on implementation. Use these configuration planning worksheets to ensure that you have met all of the prerequisites, and that you have taken into consideration all of the aspects of your particular IBM i environment.

Single sign-on prerequisite worksheet

This detailed work sheet is provided to help you ensure that you meet all hardware and software prerequisites for implementing single sign-on. To ensure a successful implementation, you must be able

to answer **Yes** to all prerequisite items in the work sheet and you should gather all the information necessary to complete the work sheets before you perform any configuration tasks.

<i>Table 9. Single sign-on prerequisite work sheet</i>	
Prerequisite work sheet	Answers
Is your system running IBM i?	
Are the following options and licensed programs installed on your server? <ul style="list-style-type: none"> • IBM i Host Servers (5770-SS1 Option 12) • Qshell Interpreter (5770-SS1 Option 30) 	
Have you installed an application that is enabled for single sign-on on each of the PCs that will participate in the single sign-on environment? Note: For the scenarios in this information, all of the PCs have IBM i Access Client Solutions (5733-XJ1) installed. See IBM i Access Client Solutions: Getting Started	
Do you, the administrator, have *SECADM, *ALLOBJ, and *IOSYSCFG special authorities?	
Do you have one of the following systems acting as the Kerberos server (also known as the KDC)? If yes, specify which system. <ol style="list-style-type: none"> 1. Windows server 2. IBM i PASE 3. AIX server 4. z/OS 	
Are all your PCs in your network configured in a Windows domain?	
Have you applied the latest program temporary fixes (PTFs)?	
Is the IBM i time within 5 minutes of the system time on the Kerberos server? If not, see Synchronize system times .	

Single sign-on configuration planning worksheet

This is a configuration planning worksheets, designed to ensure that you have met all of the hardware and software prerequisites for single sign-on. Additionally, this worksheet ensures that you have completed those Enterprise Identity Mapping (EIM) and network authentication service configuration tasks that are required for a successful single sign-on environment.

Note: The single sign-on configuration planning worksheet is designed to assist you with the implementation of a single sign-on environment based on Enterprise Identity Mapping (EIM) and network authentication services. If you intend to use a different authentication mechanism, such as IBM Tivoli Directory Server for IBM i or digital certificates, you might need to adapt portions of this work sheet to better suit your needs.

<i>Table 10. Single sign-on configuration planning work sheet</i>	
Configuration planning work sheet	Answers
Use the following information to complete the EIM Configuration wizard:	

Table 10. Single sign-on configuration planning work sheet (continued)

Configuration planning work sheet	Answers
<p>How do you want to configure EIM for your system?</p> <ul style="list-style-type: none"> • Join an existing domain • Create and join a new domain 	
<p>Where do you want to configure your EIM domain?</p>	
<p>Do you want to configure network authentication service?</p>	
<p>The Network Authentication Service wizard launches from the EIM Configuration wizard. Use the following information to complete the Network Authentication Service wizard:</p> <p>Note: The Network Authentication Service wizard can also be launched independently of the EIM Configuration wizard.</p>	
<p>What is the name of the Kerberos default realm to which your system will belong?</p> <p>Note: A Windows domain is similar to a Kerberos realm.</p>	
<p>Are you using Microsoft Active Directory?</p>	
<p>What is the Kerberos server, also known as a key distribution center (KDC), for this Kerberos default realm? What is the port on which the Kerberos server listens?</p>	
<p>Do you want to configure a password server for this default realm? If yes, answer the following questions:</p> <p>What is name of the password server for this Kerberos server? What is the port on which the password server listens?</p>	
<p>For which services do you want to create keytab entries?</p> <ul style="list-style-type: none"> • IBM i Kerberos Authentication • LDAP • IBM HTTP Server for i • IBM i NetServer • IBM i Network File System (NFS) Server • IBM i Network FTP Server 	
<p>What is the password for your service principal or principals?</p>	
<p>Do you want to create a batch file to automate adding the service principals for System A to the Kerberos registry?</p>	
<p>Do you want to include passwords with the IBM i service principals in the batch file?</p>	
<p>As you exit the Network Authentication Service wizard, you will return to the EIM Configuration wizard. Use the following information to complete the EIM Configuration wizard:</p>	
<p>Specify user information that the wizard should use when configuring the directory server. This is the connection user. You must specify the port number, administrator distinguished name, and a password for the administrator.</p>	

Table 10. Single sign-on configuration planning work sheet (continued)

Configuration planning work sheet	Answers
What is the name of the EIM domain that you want to create?	
Do you want to specify a parent DN for the EIM domain?	
Which user registries do you want to add to the EIM domain?	
Which EIM user do you want System A to use when performing EIM operations? This is the system user.	
After you complete the EIM Configuration wizard, use the following information to complete the remaining steps required for configuring single sign-on:	
What is the IBM i user profile name for the user?	
What is the name of the EIM identifier that you want to create?	
What kinds of associations do you want to create?	
What is the name of the user registry that contains the Kerberos principal for which you are creating the source association?	
What is the name of the user registry that contains the IBM i user profile for which you are creating the target association?	
What information do you need to supply to test EIM identity mapping?	

Related tasks

Configuring single sign-on

To configure a single sign-on environment you must use a compatible authentication method as your authentication method and Enterprise Identity Mapping (EIM) to create and manage your user profiles and identity mappings.

Configuring single sign-on

To configure a single sign-on environment you must use a compatible authentication method as your authentication method and Enterprise Identity Mapping (EIM) to create and manage your user profiles and identity mappings.

In the case of IBM i single sign-on solutions, the authentication method is network authentication service (Kerberos).

Because a single sign-on environment can be complex to configure, you might find it useful to create a test environment before you implement single sign-on across your enterprise. The create a test single sign-on environment scenario demonstrates how to configure such a test environment so that you can learn more about the planning needs of implementing single sign-on as well as gain a better understanding of how a single sign-on environment can work for you.

After you work with a test environment, you can use what you learn to plan how to implement single sign-on on a larger scale in your enterprise. You might find it useful to work through the enable single sign-on for IBM i scenario to learn about the more advanced configuration options that you can employ when you implement a single sign-on environment.

After you have reviewed these and the other single sign-on scenarios, you can use the single sign-on planning worksheets to create an informed single sign-on implementation plan that fits the needs of your

enterprise. With these planning worksheets in hand, you are ready to continue with the configuration process.

Configuring single sign-on involves a number of detailed configuration steps, this information describes the high-level configuration tasks for single sign-on and provides links to the more detailed configuration information for both EIM and network authentication service where appropriate.

Perform these tasks to configure a single sign-on environment:

1. Create your Windows domain
 - a) Configure the key distribution center (KDC) on the Active Directory (AD) Server.
Note: You can choose to create and run your KDC on IBM i PASE rather than create a Windows domain and run the KDC on a windows server.
 - b) Add IBM i service principals to the Kerberos server.
 - c) Create a home directory for each Kerberos user who will participate in your single sign-on environment.
 - d) Verify TCP/IP domain information.
2. Create an EIM domain by running the both the network authentication service wizard and the EIM configuration wizard on a server.

When you have completed these wizards, you have actually accomplished the following tasks:

- a) Configured IBM i interfaces to accept Kerberos tickets.
 - b) Configured the Directory server on IBM i to be the EIM domain controller.
 - c) Created an EIM domain.
 - d) Configured a user identity for IBM i and IBM i applications to use when conducting EIM operations.
 - e) Added a registry definition to EIM for the local IBM i registry and the local Kerberos registry (if Kerberos is configured).
3. Finish your configuration for the network authentication service.
Based on your single sign-on implementation plan, create a home directory for users on your servers.
 4. Based on your implementation plan, customize your EIM environment by setting up associations for the user identities in your enterprise.
 - a) Configure other servers to participate in the EIM domain.
 - b) Create EIM identifiers and identifier associations as needed.
 - c) Add additional registry definitions as needed.
 - d) Create policy associations as needed.
 5. Test your single sign-on configuration.

To verify that you have configured the network authentication service and EIM correctly, sign on to the system with a user ID, and then start a 5250 emulator session from IBM i Access Client Solutions. If no IBM i sign-on prompt displays, EIM successfully mapped the Kerberos principal to an identifier on the domain.

Note: If you find that your test of your single sign-on configuration fails, there might be a problem with your configuration. You can troubleshoot single sign-on and learn how to recognize and fix common problems with your single sign-on configuration.

Related concepts

[Scenario: Creating a single sign-on test environment](#)

In this scenario, you want to configure network authentication service and EIM to create a basic single sign-on test environment. Use this scenario to gain a basic understanding of what configuring a single sign-on environment involves on a small scale before implementing single sign-on across an entire enterprise.

[Scenario: Enabling single sign-on for IBM i](#)

View this scenario to learn how to configure network authentication service and EIM to create a single sign-on environment across multiple systems in an enterprise. This scenario expands on the concepts and

tasks presented in the previous scenario which demonstrates how to create a simple single sign-on test environment.

[Single sign-on planning worksheets](#)

Complete these worksheets to ensure that you have met all of the prerequisites for single sign-on and that you have considered all of the aspects of your particular system and its security requirements.

Related tasks

[Planning for single sign-on](#)

The single sign-on planning process identifies the software and hardware prerequisites required to implement single sign-on in your enterprise.

[Troubleshooting single sign-on](#)

Use the following troubleshooting methods to solve some of the basic problems you might experience while configuring and using a single sign-on environment.

Related information

[Configuring network authentication service](#)

[Configuring Enterprise Identity Mapping](#)

Managing single sign-on

Use network authentication service and Enterprise Identity Mapping (EIM) to manage your single sign-on environment.

After you implement a single sign-on environment, you might need to perform various management tasks to maintain that environment in accordance with your security policy just as you would any other aspect of your network.

To learn more about how to manage these functions to maintain your single sign-on environment, review the following:

- [Manage network authentication service](#)

Learn about common network authentication service management tasks such as how to synchronize system times, add and delete realms, add a Kerberos server, and more.

- [Manage EIM](#)

Learn about common EIM management tasks, such as how to manage associations, identifiers, registry definitions, and more.

If you experience problems with your single sign-on environment, you can troubleshoot single sign-on.

Related tasks

[Troubleshooting single sign-on](#)

Use the following troubleshooting methods to solve some of the basic problems you might experience while configuring and using a single sign-on environment.

Troubleshooting single sign-on

Use the following troubleshooting methods to solve some of the basic problems you might experience while configuring and using a single sign-on environment.

There are several actions that you can take to circumvent problems with your IBM i single sign-on configuration:

1. You can confirm that your network authentication service configuration is correct by performing the qshell `kinit` command.

To do this, enter the qshell environment and issue the `kinit -k <service name>` command. This command uses the keytab entry that was created in the network authentication service wizard. This command verifies that the encrypted password for the service is the same password that is stored on the KDC. If this command does not complete successfully, revisit your network authentication service configuration.

2. Verify your host name resolution configurations, including your DNS servers.
3. Verify the EIM system configuration information on each IBM i system that performs mapping lookup operations.
 - a) In IBM Navigator for i, expand **IBM i Management > Network > All Tasks > Enterprise Identity Mapping**.
 - b) Click **Configuration**.
 - c) Right-click the **Domain Controller** with which you want to work and select **Properties**.
 - d) On the **Domain** page, verify the domain connection settings and click **Verify Configuration**. This verifies that the domain controller is active and that the settings for the domain controller are correct.
 - e) On the **System User** page, click **Verify Connection** to verify that the system user is specified correctly.
4. Verify defined EIM associations by using the test EIM mapping function to verify that the associations you have defined provide the mappings you expect.
5. If your single sign-on configuration includes a multiple tier network, verify that ticket delegation is enabled for the server in the middle tier. This is required for the middle tier server to forward user credentials to the next server. You can enable ticket delegation on the Active Directory or Kerberos server. An example of a multiple tier network is a PC which authenticates with one server and then connects to another server.

If you are still experiencing a problem with your single sign-on after reviewing the steps above, use the following table to determine possible solutions to the symptoms of your configuration problems:

<i>Table 11. Troubleshooting table</i>	
Symptoms	Possible solutions
Host name resolution problems	
You are unable to connect to IBM i systems within your single sign-on environment.	<ul style="list-style-type: none"> • This might be due to host resolution problems. Verify that the PC and your IBM i resolve to the same host name. Verify your host name resolution configurations, including your DNS server. • This might be due to NAS configuration problems. See the Troubleshoot network authentication service information in the IBM i Information Center.
The NSLOOKUP utility fails to resolve a host name when given an IP address during an attempt to confirm that the host resolution is consistent between your IBM i system and a client PC.	The NSLOOKUP utility uses the currently configured DNS to resolve IP addresses from host names, as well as host names from IP addresses. If a host name cannot be resolved from an IP address, the most likely cause is a missing PTR record in DNS. Have your DNS administrator add a PTR record for this IP address.
EIM configuration problems	

Table 11. Troubleshooting table (continued)

Symptoms	Possible solutions
<p>EIM mappings are not working as expected. In some instances, you are unable to sign into your system with IBM i Access Client Solutions when using Kerberos authentication.</p>	<ul style="list-style-type: none"> • The domain controller is inactive. Activate the domain controller. • The EIM configuration is incorrect on the systems that you are trying to use Kerberos authentication with or get mappings for. Verify your EIM configuration. On the system you are trying to authenticate with, expand Network > All Tasks > Enterprise Identity Mapping. Click Configuration. Right-click the Domain Controller with which you want to work and select Properties. Verify the following: <ul style="list-style-type: none"> – Domain page: <ul style="list-style-type: none"> - The domain controller name and port numbers are correct. - Click Verify Configuration to verify that the domain controller is active. - The local registry name is specified correctly. - The Kerberos registry name is specified correctly. - Verify that Enable EIM operations for this system is selected. – System user page: <ul style="list-style-type: none"> - The specified user has sufficient EIM access control to perform a mapping lookup, and the password is valid for the user. See the online help to learn more about the different types of user credentials. <p>Note: Whenever passwords are updated in the directory server, they must also be updated in the system configuration.</p> - Click Verify Connection to confirm that the user information specified is correct. • The EIM domain configuration is incorrect: <p>Note: You can test EIM mapping to help verify that the associations for your EIM domain are properly configured.</p> <ul style="list-style-type: none"> – A target or source association for an EIM identifier is not set up correctly. For example, there is no source association for the Kerberos principal (or Windows user) or it is incorrect. Or, the target association specifies an incorrect user identity. <u>Display all identifier associations for an EIM identifier</u> to verify associations for a specific identifier. – A policy association is not set up correctly. <u>Display all policy associations for a domain</u> to verify source and target information for all policy associations defined in the domain. – Mapping lookups are returning more than one target identity, indicating that ambiguous mappings are configured. <u>Test EIM mappings</u> to identify which mappings are incorrect. – The registry definition and user identities do not match because of case sensitivity. You can delete and re-create the registry, or delete and re-create the association with the proper case.

Table 11. Troubleshooting table (continued)

Symptoms	Possible solutions
	<ul style="list-style-type: none"> • EIM support is not enabled. <ul style="list-style-type: none"> – EIM has been disabled for the system. Verify that Enable EIM operations for this system is selected on the Domain page for the system EIM configuration properties by expanding Network > All Tasks > Enterprise Identity Mapping. Click Configuration. Right-click the Domain Controller with which you want to work and select Properties. – Policy association support is not enabled at the domain level. You might need to enable policy associations for a domain. – Mapping lookup support or policy association support is not enabled at the individual registry level. You might need to enable mapping lookup support and the use of policy associations for the target registry.
Network authentication service configuration problems	
<p>A keytab entry is not found when you perform a keytab list.</p>	<ul style="list-style-type: none"> • This can be due to a host resolution problem on the IBM i. If you are using a host table, perform the Configure TCP/IP CFGTCP command, option 10 (Work with TCP/IP host table entries) and verify that the primary host name is listed first for the IP address of the server. • Verify your host name resolution configurations, including your DNS server.
<p>Users are unable to connect to systems.</p>	<p>Users might be unable to connect to systems if the EIM registry definition for the Kerberos registry was inappropriately defined as case sensitive. Delete and re-create the Kerberos registry.</p> <p>Note: You will lose any associations that have been defined for that registry and will have to re-create them.</p>
<p>User receives a message indicating an incorrect password when verifying the network authentication service configuration.</p>	<p>The password for the service in the KDC does not match the password for the service in the keytab. Update the keytab entry by using the keytab add command, and update the password for the service on the KDC.</p>
<p>User receives the following message: Unable to obtain name of default credentials cache.</p>	<p>Verify that a home directory (/home/<user profile>) exists for the user that is performing the kinit.</p>
<p>User receives the following message: Response too large for datagram.</p>	<p>Update the network authentication service configuration to use TCP as the data communications protocol:</p> <ol style="list-style-type: none"> 1. Using IBM Navigator for i, for the system that issued the message, expand Security > All Tasks > Network Authentication Service. 2. Click Properties. 3. On the General page, select Use TCP and click OK.
General problems	

Table 11. Troubleshooting table (continued)

Symptoms	Possible solutions
<p>You receive error message CWBSY10XX when attempting single sign-on.</p>	<ul style="list-style-type: none"> • Use the help associated with the text to resolve the problem. • Use the System Access detail trace feature to determine if the appropriate Kerberos ticket is retrieved. • Download the Microsoft kerbray utility to verify that the user has Kerberos credentials. • If single sign-on is failing, check the QZSOSIGN jobs in the QUSRWRK subsystem. Search through the jobs for a CPD3E3F message. If you find the CPD3E3F message, use the recovery information provided within the message. The diagnostic message contains both major and minor status codes to indicate where the problem occurred. The most common errors are documented in the message along with the recovery. • If PC5250 is failing, check the following: <ul style="list-style-type: none"> – Check the QTVDEVICE jobs for the CPD3E3F message. – Check the QRMTSIGN system value and verify that it is set to *VERIFY or *SAMEPRF.


Related information

- [RFC 1713: Tools for DNS debugging](#)
- [Troubleshoot EIM.](#)
- [Configuring network authentication service](#)
- [Host name resolution considerations](#)
- [Testing EIM mappings](#)

Related information for Single sign-on

IBM Redbooks® publications and other information center topic collections contain information that relates to the Single sign-on topic collection. You can view or print any of the PDF files.

IBM Redbooks

The [IBM System i Security Guide for IBM i5/OS Version 5 Release 4](#)  IBM Redbooks publication provides a chapter on authentication using Single sign-on.

Other information

- [Enterprise Identity Mapping \(EIM\)](#)
- [Network authentication services](#)
- [IBM Tivoli Directory Server for IBM i](#)
- [Digital Certificate Manager](#)

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