Session: **403971 / 42CB**

eserver iSeries

iSeries Access for Windows: Security and Communications Tips

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iSeries Access Development

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Agenda

- Connections with iSeries Access for Windows
  - Connection types supported
  - Configuration
  - Troubleshooting
- Using iSeries Access in an Internet Environment
  - Firewalls
    - Includes new info on Windows XP SP2
  - NAT
  - VPNs
  - Other Security Considerations
- Using iSeries Access with Terminal Services
  - Functions supported
  - iSeries Access restrictions
  - Windows 2000 considerations
- Appendix A: Example of terminal services install and config
- Appendix B: Example of internet connection through firewall

Connection Types Supported

iSeries Access for Windows Connectivity

- Windows 95/98/NT/2000/XP/2003 TCP/IP
  - LAN
  - PPP
  - SLIP
  - Twinax (requires separate TCP/IP driver)
- Any 32-bit Winsock 2.x or higher provider

Note: Windows XP support requires V5R1M0 version of Client Access Express and service pack SI01907. See Info APAR II12900 for information on restrictions

Windows 2003 requires V5R2M0 of iSeries Access for Windows and service pack SI07765 (for 32-bit) or SI08894 (for 64-bit). See Info APAR II13465 for information on restriction.

LAN Connections

- LAN connections supported:
  - Token Ring (4M and 16M)
  - Ethernet
  - 100 M Ethernet
  - 1 Gig Ethernet
  - ATM
- If Windows supports a specific LAN card, it should work with iSeries Access for Windows

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Dial-up connections

- Windows PPP and SLIP direct to iSeries
  - Requires iSeries V4R2 or later
  - See TCP/IP Configuration and Reference (SC41-5420) for details

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TCP/IP over Twinax

- iSeries Access configuration is same as a LAN TCP/IP connection.
- However, the TCP/IP over twinax drivers are not shipped with iSeries Access.
- They can be obtained from the following URL: http://www.networking.ibm.com/525tcpip/index.html
- iSeries Access support statement is located in Info APAR ii11022.
- All 5250 Express cards are supported, some non-Express cards are supported.
- For Windows XP support, make sure the latest driver is obtained. There is no driver available for Windows Server 2003.

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Configuring and Managing Connections

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Managing Connections

- Managing of connections is integrated into iSeries Navigator
- iSeries Navigator can be used to create, delete, and change properties of connections.
- Connections can also be created by simply specifying the iSeries system name in the desired applications.

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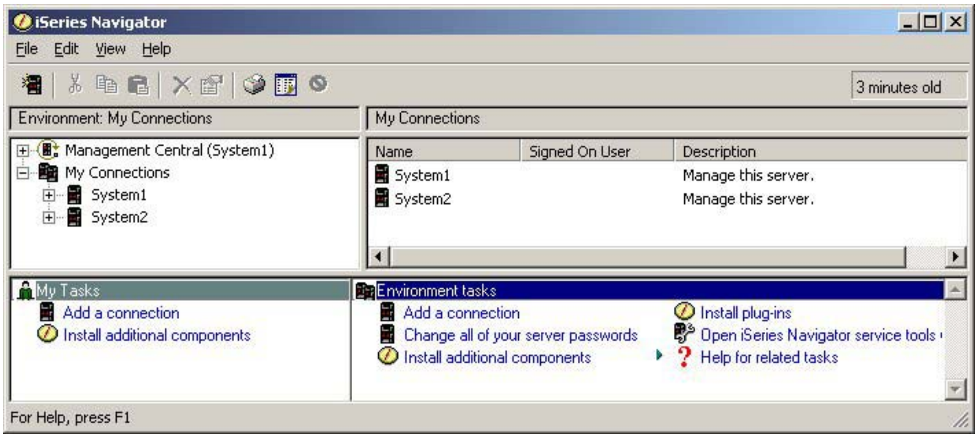
iSeries Navigator Main Windows

- Left Window shows active environment and configured systems.
- Right Window shows contents of current selection.



iSeries Navigator

3 minutes old

Environment: My Connections

- Management Central (System1)
- My Connections
  - System1
  - System2

My Connections

Name	Signed On User	Description
System1		Manage this server.
System2		Manage this server.

My Tasks

- Add a connection
- Install additional components

Environment tasks

- Add a connection
- Change all of your server passwords
- Install additional components
- Install plug-ins
- Open iSeries Navigator service tools
- Help for related tasks

For Help, press F1

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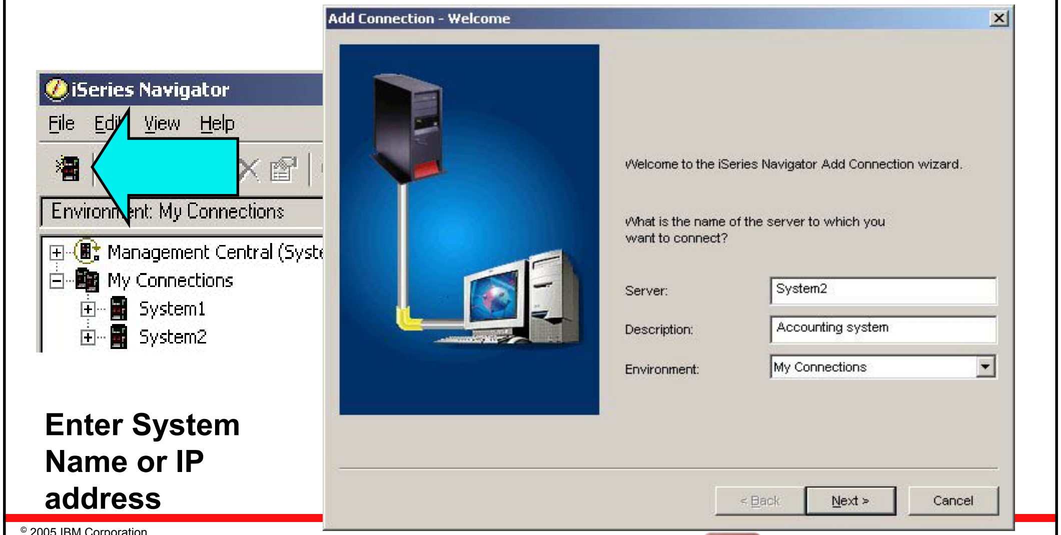
Creating a new connection

- Adding a new connection
  - Click on "Add Connection" icon on toolbar



Welcome to the iSeries Navigator Add Connection wizard.

What is the name of the server to which you want to connect?

Server: System2

Description: Accounting system

Environment: My Connections

Enter System Name or IP address

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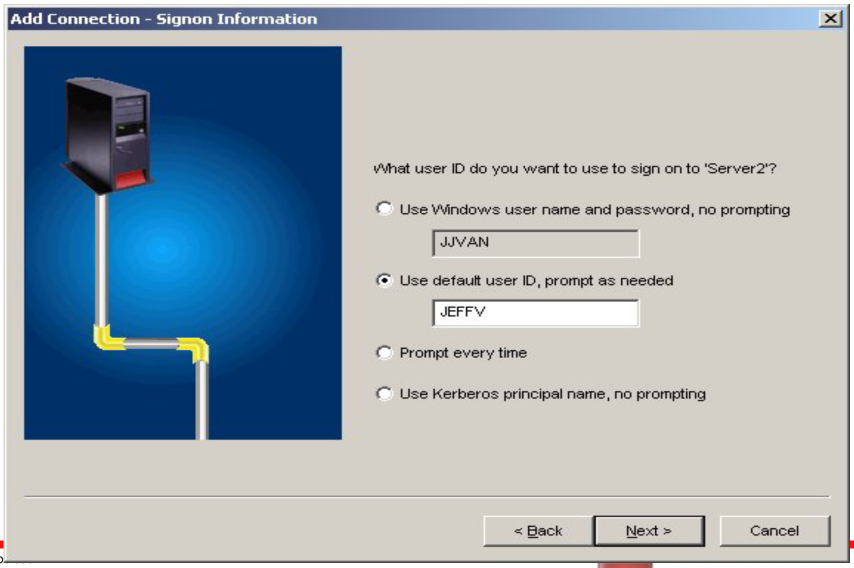
Sign-on Options

- Enter appropriate signon option



What user ID do you want to use to sign on to 'Server2'?

○ Use Windows user name and password, no prompting

JJVAN

● Use default user ID, prompt as needed

JEFFV

○ Prompt every time

○ Use Kerberos principal name, no prompting

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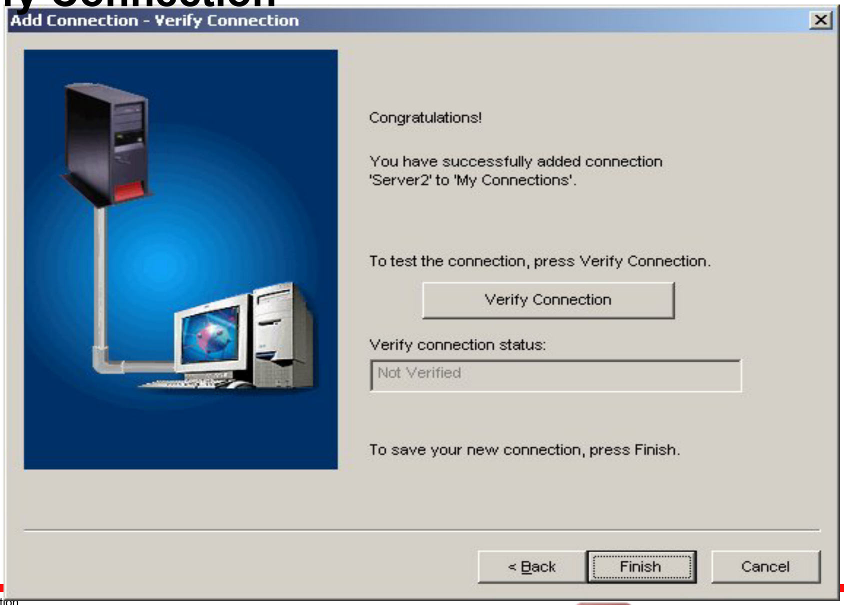
Verify Connection



Congratulations!

You have successfully added connection 'Server2' to 'My Connections'.

To test the connection, press Verify Connection.

Verify connection status:

Not Verified

To save your new connection, press Finish.

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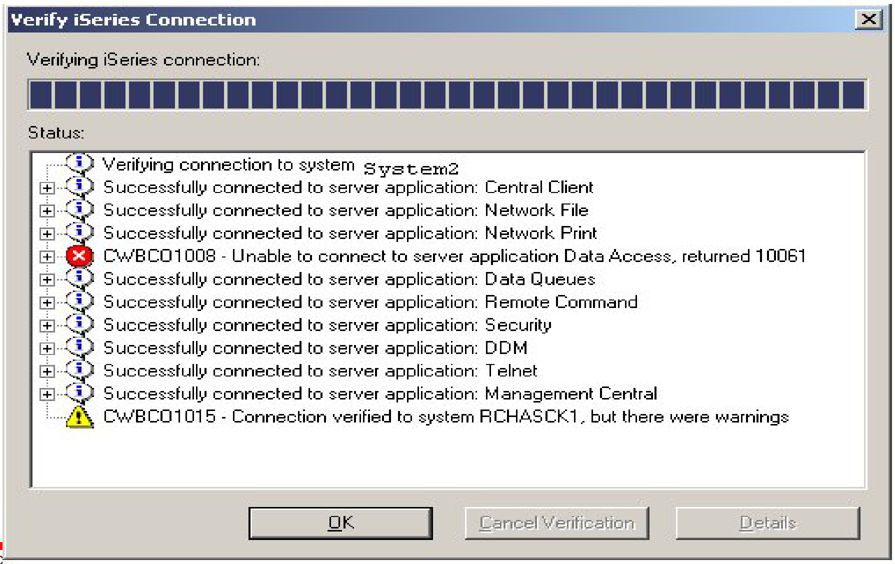
Verification

- Verification screen allows detailed messages to be displayed when the "+" is clicked on.



Verifying iSeries connection:

Status:

```
Verifying connection to system System2
Successfully connected to server application: Central Client
Successfully connected to server application: Network File
Successfully connected to server application: Network Print
CWBCO1008 - Unable to connect to server application Data Access, returned 10061
Successfully connected to server application: Data Queues
Successfully connected to server application: Remote Command
Successfully connected to server application: Security
Successfully connected to server application: DDM
Successfully connected to server application: Telnet
Successfully connected to server application: Management Central
CWBCO1015 - Connection verified to system RCHASCK1, but there were warnings
```

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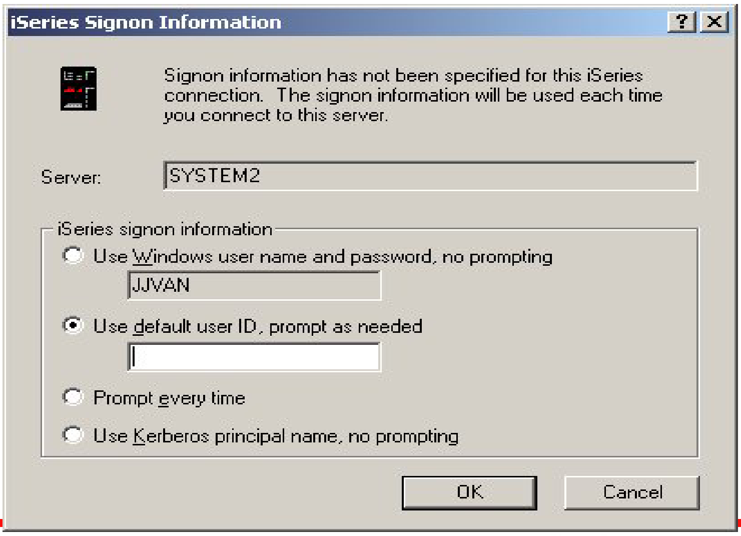
Config-free connection

- Simply start up an application (like Data Transfer), specify a new system name, and you'll be prompted for signon option.



iSeries Signon Information

Signon information has not been specified for this iSeries connection. The signon information will be used each time you connect to this server.

Server: SYSTEM2

iSeries signon information

○ Use Windows user name and password, no prompting

JJVAN

● Use default user ID, prompt as needed

○ Prompt every time

○ Use Kerberos principal name, no prompting

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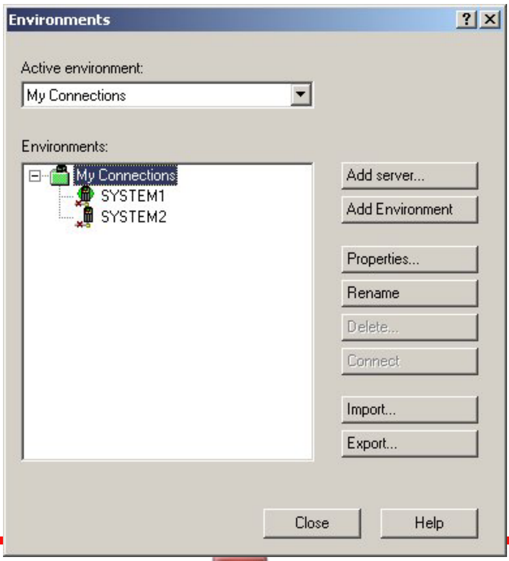
Managing Environments & Connections

The Environments View offers a lot more interaction with the environments and connections.

The Environments View is opened from Operations Navigator by selecting Connections to Servers ->Environments from the File menu.

This will bring up the screen shown, which allows the user to manage all defined environments and iSeries connections. One can also define new ones.



Environments

Active environment: My Connections

Environments:

My Connections
SYSTEM1
SYSTEM2

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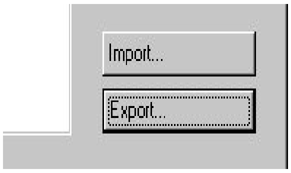
Importing & Exporting Environments

The Export option allows the user to save the environment definition, including all connections it contains.

The environment will save the environment as a *.ENV file. The default name of the file will be the name of the environment.

Then the Import option can be used to restore the environment, and the connections.

This can be useful to distribute common connection definitions to several PCs. The connections can be defined on one PC and then exported to a location where the other PCs can import the environment.



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Importing & Exporting Environments

Even though iSeries Access for Windows allows environments to be created with names that contain the characters \ / : * ? " < > and |, the Windows operating systems will not accept these characters as part of a file name. So environments that contain these characters will not be able to be exported or imported.

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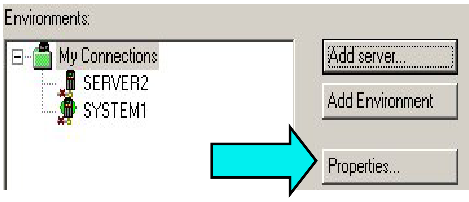
Properties



Selecting the Properties button allows the user to view or change the properties of either connections or environments.

Whatever connection or environment that is highlighted when the Properties button is selected will be displayed.

The only property of an environment is the default system.

- The default system will specify which of the connections within the environment will be used to download a language conversion table from if the table isn't on the PC, if this environment is set to the active environment.
- The default system will also be the default system name presented when configuring a new PC5250 or Data Transfer session.

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System Connection Properties

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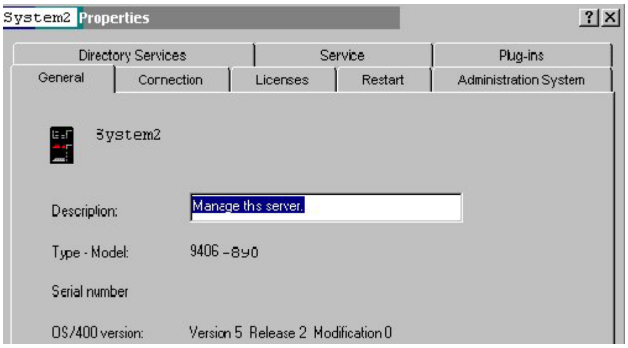
Properties

The properties of a connection display a lot more information.

The following property tabs are available.

- General
- Connection
- Secure Sockets
- Licenses
- Restart
- Directory Services
- Plug-ins



System2 Properties

System2

Description: Manage ths server.

Type - Model: 9406 -890

Serial number

OS/400 version: Version 5 Release 2 Modification 0

Some of these properties will not be able to be interacted with if the connection isn't currently active. So the user might be prompted to signon to the system while interacting with the properties.

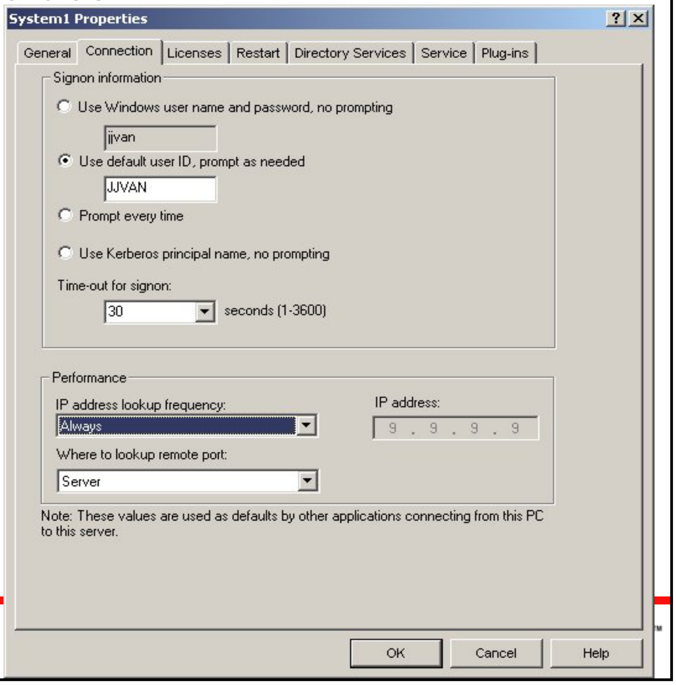
Note: Properties can also be accessed by right-clicking on the system name in iSeries Navigator

More on Properties

- Changing Connection and Secure Sockets properties does not change active connections (including the iSeries Navigator session).
- After changing any properties, end any applications that are using a connection to that iSeries.
- Individual iSeries Access applications each can set their own connection properties, which may take precedence over the global properties set in iSeries Navigator.

Connection Properties

- The Connection tab allows the user to modify the iSeries Signon Information and Performance preferences of the connection. Each of these will be discussed.



System1 Properties

Signon information

○ Use Windows user name and password, no prompting

jjvan

● Use default user ID, prompt as needed

JJVAN

○ Prompt every time

○ Use Kerberos principal name, no prompting

Time-out for signon: 30 seconds (1-3600)

Performance

IP address lookup frequency: Always

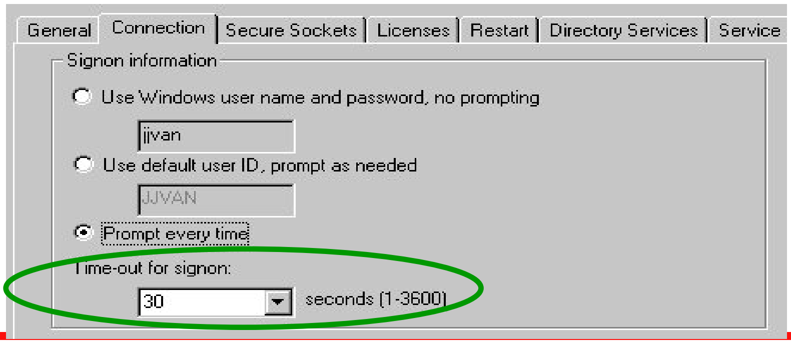
IP address: 9 . 9 . 9 . 9

Where to lookup remote port: Server

Note: These values are used as defaults by other applications connecting from this PC to this server.

Connection Timeout Value -

- Rather than wait for a significant number of minutes for a connection attempt to timeout, shorten the timeout period for this PC.
- If the network is slow, you can give yourself a longer period of time to connect.
- The default is 30 seconds. If you have a slow connection, try increasing this value if you have trouble connecting.



Signon information

○ Use Windows user name and password, no prompting

jjvan

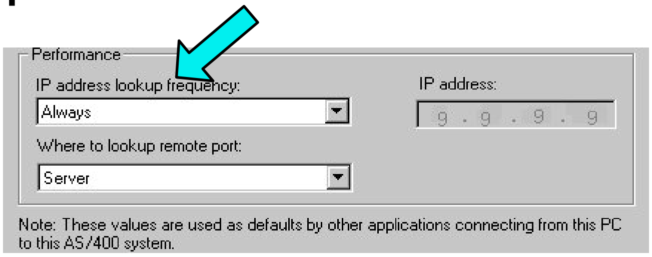
○ Use default user ID, prompt as needed

JJVAN

● Prompt every time

Time-out for signon: 30 seconds (1-3600)

Performance Properties



Performance

IP address lookup frequency: Always

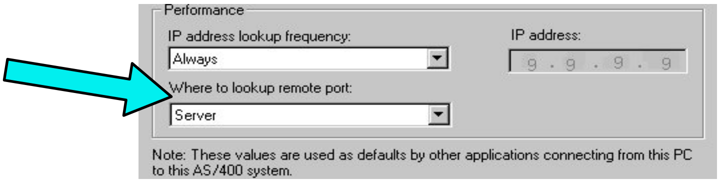
IP address: 9 . 9 . 9 . 9

Where to lookup remote port: Server

Note: These values are used as defaults by other applications connecting from this PC to this AS/400 system.

- IP address lookup options
  - Always
  - One hour
  - One day
  - One week
  - Never - Specify an IP address (host file entry needed for PC5250)
  - After startup of PC
- Depending on your network, IP address resolution may take several seconds.
- Less frequent lookups improve performance.
- If IP address given as system name, no lookup occurs and no host file entry needed for PC5250

Performance Properties



Performance

IP address lookup frequency: Always

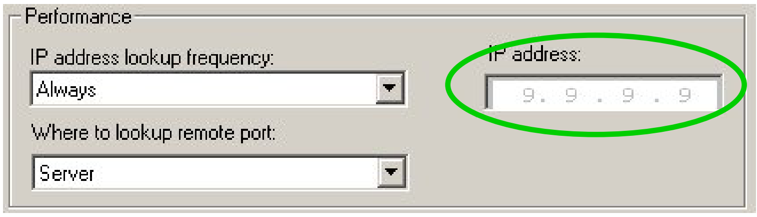
IP address: 9 . 9 . 9 . 9

Where to lookup remote port: Server

Note: These values are used as defaults by other applications connecting from this PC to this AS/400 system.

- "Where to lookup remote port" options
  - Server
    - Server mapper is always used for port resolution
  - Local
    - Use the local Services file on PC to resolve. Note: All Client Access servers must then be added manually into this file.
  - Standard
    - Always use the default port, no lookup
- Local and Standard will result in better performance, since server mapper does not have to be contacted first.

Performance properties



Performance

IP address lookup frequency: Always

Where to lookup remote port: Server

IP address: 9 . 9 . 9 . 9

- IP Address
  - Lists last IP address used to access this iSeries
  - Cannot be changed from properties page, unless IP address lookup is changed to "Never".
- Note: iSeries Access for Windows does not update the Hosts file on your PC.

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Secure Sockets Properties and Support

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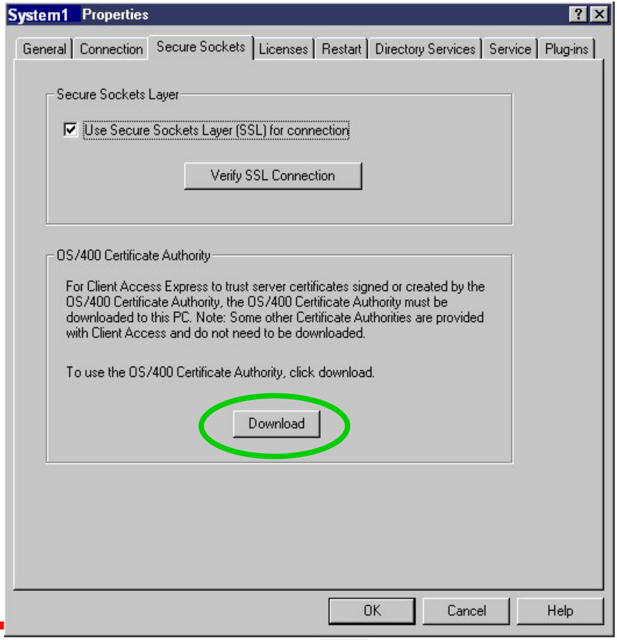
SSL Properties

- Secure Sockets
  - Enable/Disable SSL
  - Verify SSL Connections
  - Download Certificate Authority



☑ Use Secure Sockets Layer (SSL) for connection

For Client Access Express to trust server certificates signed or created by the OS/400 Certificate Authority, the OS/400 Certificate Authority must be downloaded to this PC. Note: Some other Certificate Authorities are provided with Client Access and do not need to be downloaded.

To use the OS/400 Certificate Authority, click download.

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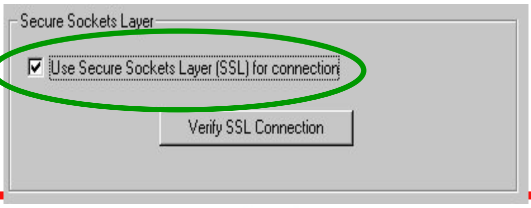
Security Properties

- Specify if SSL should be used or not.
- SSL stands for Secure Sockets Layer, and specifies that encryption will be used for the sessions.
- Only SSL server authentication is supported. The exception is that client authentication has been added for PC5250 only in V5R1 and later.
- This option will be greyed out unless the 5769-CE1, CE2, or CE3 LPP is installed on the iSeries and the PC. The user must have access to: QIBM/ProdData/CA400/Express/SSL/SSLxxx, where xxx is 40, 56, or 128.
  - CE1 = 40-bit encryption **(no longer available in V5R1)**
  - CE2 = 56-bit encryption **(no longer available in V5R2)**
  - CE3 = 128-bit encryption



☑ Use Secure Sockets Layer (SSL) for connection

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SSL Information

- SSL is the current standard for World Wide Web security.
- When it is turned on, all data flows are encrypted, with the exception of the port mapper handshake.
- When it is turned off, all data flows unencrypted, with the exception of the connection password. If the emulator is being used, the password does flow in the clear as part of the telnet session (unless bypass signon is used).
- Always use encryption when communicating via the Internet to your iSeries.

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SSL InformationSSL Information

- Before making an SSL connection to an iSeries, the following must be true:
  - 5769-AC1, AC2, or AC3 must be installed on the iSeries (this is the iSeries side of SSL).
    - The encryption level (40, 56, or 128-bit) will be negotiated between the PC and the iSeries to the highest level supported by both.
  - A certificate must be available on the iSeries, and assigned to the iSeries Access Servers through the iSeries Digital Certificate Manager.
    - Note: Once certificate is available on iSereis, host servers will automatically be SSL-enabled.
  - The matching signer certificate or Certificate Authority must be available on the PC.

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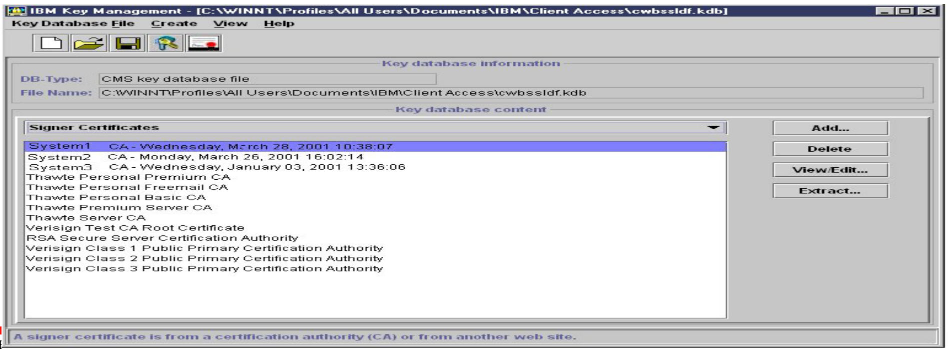
Certificate Management

- IBM Key Management utility is included as part of installing CE1,2, or 3 on the PC.
- Can be accessed through Control Panel, under iSeries Access for Windows properties for Secure Sockets
- Recommend that a certificate by a well-known certificate authority (such as Verisign) be used.
- A number of well-known certificate authorities are already stored in the key database.
- Using any other type of certificate will require transferring certificate authorities from other sources.



IBM Key Management - [C:\WINNT\Profiles\All Users\Documents\IBM\Client Access\cwbssldf.kdb]

Key database information

DB-Type: CMS key database file

File Name: C:\WINNT\Profiles\All Users\Documents\IBM\Client Access\cwbssldf.kdb

Key database content

Signer Certificates

```
System1   CA - Wednesday, March 28, 2001 10:38:07
System2   CA - Monday, March 26, 2001 16:02:14
System3   CA - Wednesday, January 03, 2001 13:36:06
Thawte Personal Premium CA
Thawte Personal Freemail CA
Thawte Personal Basic CA
Thawte Premium Server CA
Thawte Server CA
Verisign Test CA Root Certificate
RSA Secure Server Certification Authority
Verisign Class 1 Public Primary Certification Authority
Verisign Class 2 Public Primary Certification Authority
Verisign Class 3 Public Primary Certification Authority
```

A signer certificate is from a certification authority (CA) or from another web site.

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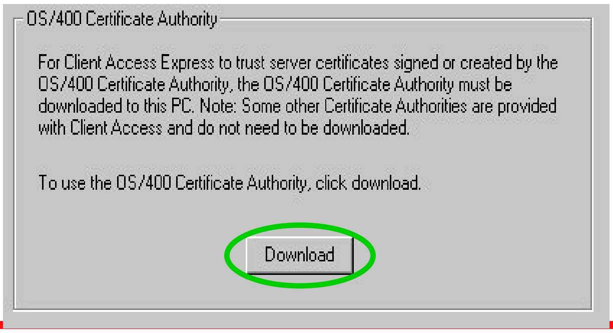
Downloading Certificate Authorities

- Button is available to download CA from the iSeries
- The CA is automatically imported into the iSeries Access key database and the Java key database (required by iSeries Navigator).
- Previously, a separately downloadable utility had to be downloaded from the web to do this.



OS/400 Certificate Authority

For Client Access Express to trust server certificates signed or created by the OS/400 Certificate Authority, the OS/400 Certificate Authority must be downloaded to this PC. Note: Some other Certificate Authorities are provided with Client Access and do not need to be downloaded.

To use the OS/400 Certificate Authority, click download.

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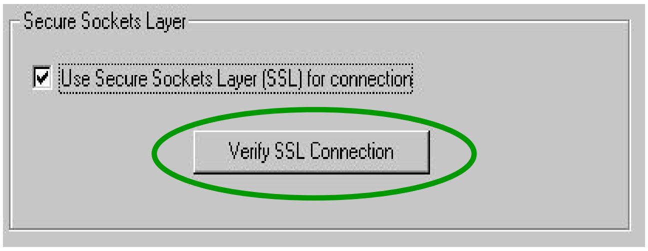
Verify SSL Connections

- A verify button is included on the Secure Sockets properties page.
- This allow you to check if the iSeries Access servers are enabled for SSL.

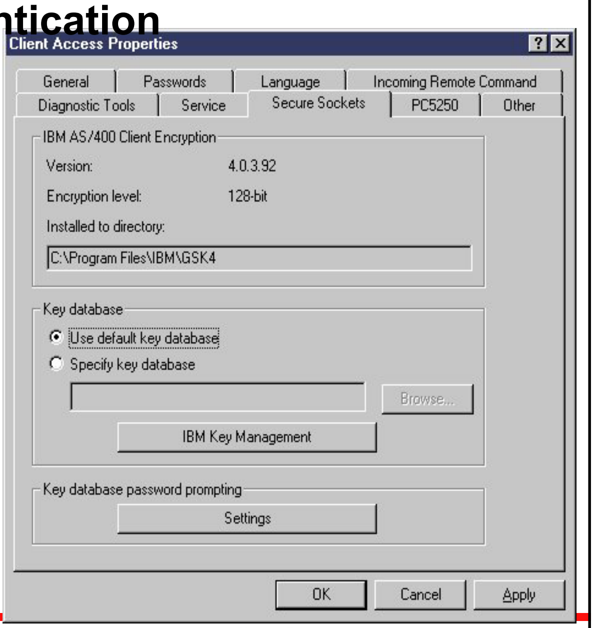


Secure Sockets Layer

☑ Use Secure Sockets Layer (SSL) for connection

PC5250 Client Authentication

- SSL client authentication can be enabled for the OS/400 Telnet server.
- iSeries Access for Windows PC5250 support has been enhanced to take advantage of this.
- SSL server authentication must always be configured before client authentication will work.
- No settings are required on the client to enable client authentication, but some preferences can be set.



Client Access Properties

IBM AS/400 Client Encryption

Version: 4.0.3.92

Encryption level: 128-bit

Installed to directory: C:\Program Files\IBM\GSK4

Key database

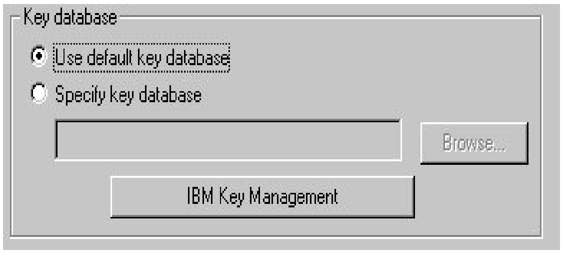
● Use default key database

○ Specify key database

Key database password prompting

Key Database Selection

- User can select which key database to use on their PC.
- For most users, keeping the default key database selection selected is fine.
- The IBM Key Management Utility can also be invoked from here to view the contents of key databases on your PC.



Key database

● Use default key database

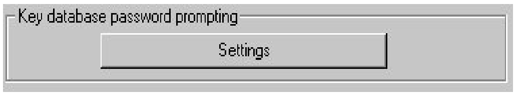
○ Specify key database

Browse...

IBM Key Management

Client Authentication Prompting modes

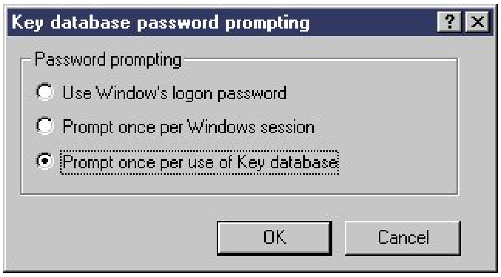
- Users can choose how often they are prompted for access to the key database.
- Its important to authenticate that the user has access to the key database before the certificate is sent up to the iSeries. Otherwise, someone could simply move the key database file to another PC and have access to the certificate.



Key database password prompting

Settings

Note: A policy can be used by an administrator to force one of these.



Key database password prompting

Password prompting

○ Use Window's logon password

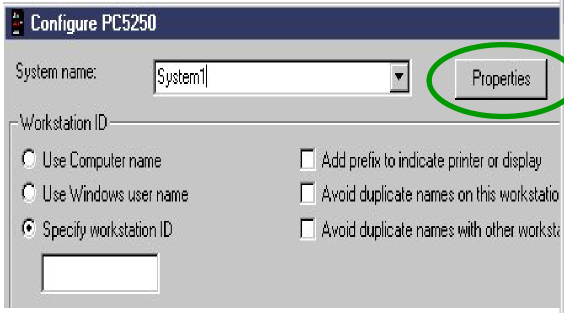
○ Prompt once per Windows session

● Prompt once per use of Key database

OK Cancel

Certificate Selection

- PC5250 configuration allows user to choose if they want to be prompted with a list of certificates to choose from to send to iSeries.



Configure PC5250

System name: System1

Workstation ID

○ Use Computer name

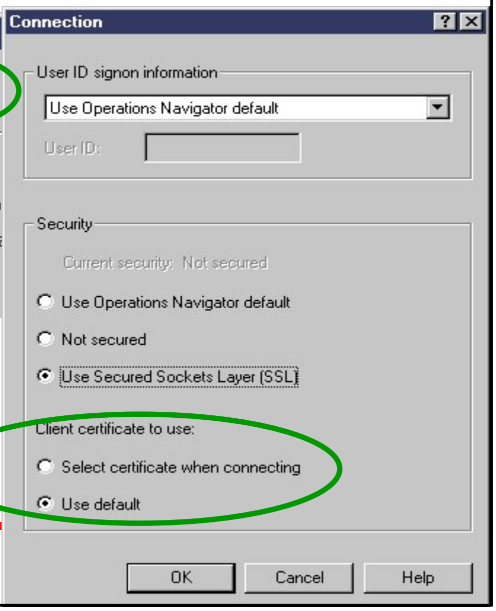
○ Use Windows user name

● Specify workstation ID

□ Add prefix to indicate printer or display

□ Avoid duplicate names on this workstatio

□ Avoid duplicate names with other worksta



Connection

User ID signon information

Use Operations Navigator default

User ID:

Security

Current security: Not secured

○ Use Operations Navigator default

○ Not secured

● Use Secured Sockets Layer (SSL)

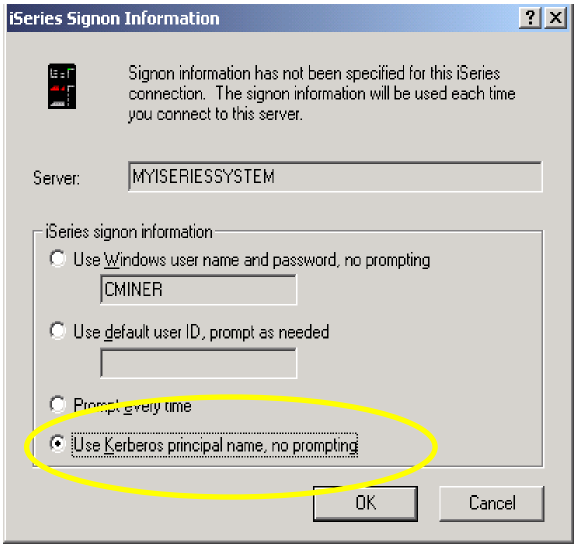
Client certificate to use:

○ Select certificate when connecting

● Use default

Recommend just using the default.

Kerberos added to V5R2 version



iSeries Signon Information

Signon information has not been specified for this iSeries connection. The signon information will be used each time you connect to this server.

Server: MYISERIESSYSTEM

iSeries signon information

○ Use Windows user name and password, no prompting

CMINER

○ Use default user ID, prompt as needed

○ Prompt every time

● Use Kerberos principal name, no prompting

- Support for Kerberos authentication of users
  - Kerberos ticket can replace the sending of userid and password from a PC to the iSeries.
  - Kerberos authentication as a new connection property to select

Kerberos role in Single Sign-on

- Uses Kerberos protocol for authentication.
  - Network authentication protocol invented by MIT.
  - Freely available from MIT.
  - Ticket based, third party authentication scheme.
- Uses EIM (Enterprise Identity Mapping) to manage users in an enterprise.
  - Uses LDAP technology to keep track of who users are in an enterprise.
  - Kerberos names to iSeries user profiles.

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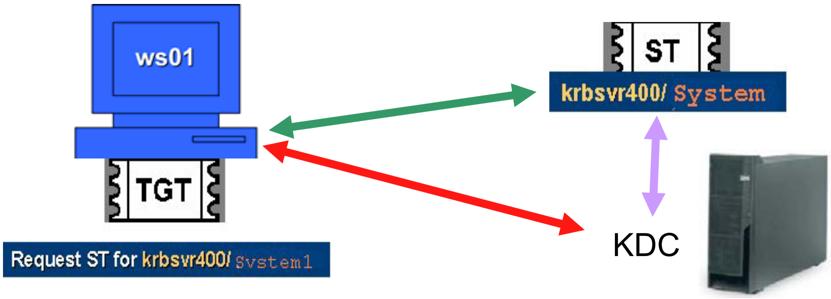
Overview of Kerberos signon process

- Windows domain login. When you authenticate using Kerberos you get a Ticket-Granting-Ticket (**TGT**) from the Kerberos Key Distribution Center (**KDC**)
- iSeries Connection request. Obtain an appropriate Service-Ticket (**ST**) for that iSeries **krbsvr400/<host name>**
- iSeries validation. The iSeries server validates the **ST** with the **KDC**
- iSeries profile mapping. Using **EIM** an iSeries user profile is mapped to the user



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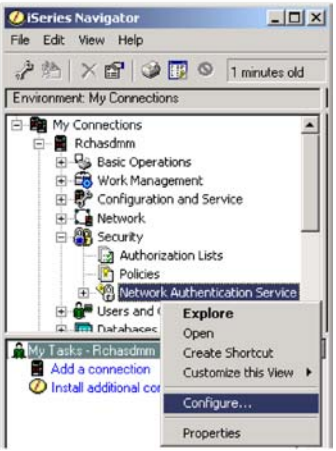
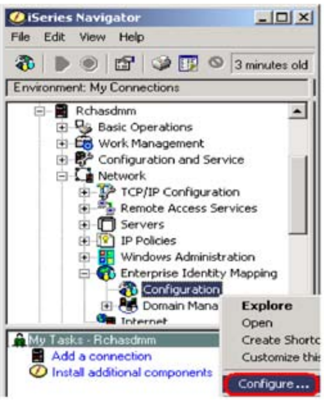
Wizards available for configuring both Kerberos and EIM

1. Launch point



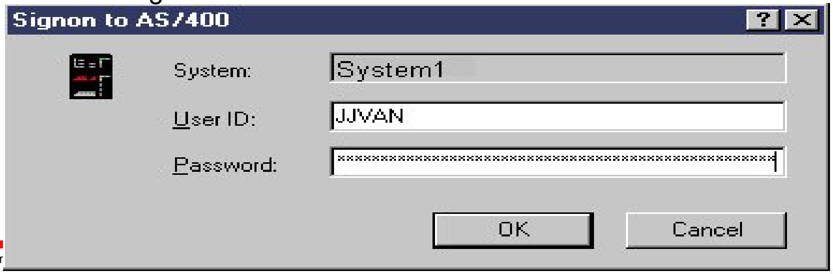
Launch Point for EIM wizard



Other Communication Support

Long Password Support

- Connections to V5R1 or later iSeries servers can be done with 128-character passwords, for better security.
- The Password Level (QPWDLVL) must be set to 2 or 3 for these long passwords to be used.
  - A value of 0 is the default and allows 1 to 10-character passwords.
  - A value of 1 allows 1 to 10-character passwords and iSeries Netserver passwords for Windows 95,98,Me will be removed from the system.
  - A value of 2 enables 1 to 128-bit passwords.
  - A value of 3 enables 1 to 128-bit passwords, and iSeries Netserver passwords for Windows 95,98,Me will be removed from the system.
- Password level can be modified in green screen, or through Security ->Policies within iSeries Navigator.



Signon to AS/400

System: System1

User ID: JJVAN

Password: ***

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Long Password Support (continued)

- Long passwords can have mixed case and can use virtually and character that can be keyed on the keyboard (including spaces that aren't trailing).
  - Be careful when using multiple languages, since its possible to set a password on one PC, and not be able to enter it on another if they have different character sets.
- When making iSeries Netserver connections, be aware that by default, only Windows NT,2000, XP, and 2003 PCs will be able to make that connection.

Possible Password:
This password is so long that there is no way that I'll be able to remember it, so I'm going to make it a phrase I can recall.

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Data Compression -

- V5R1and later iSeries Access communications supports data compression.
- This reduces network traffic and improves performance of data flows.
- Unicode data is also handled.
- Data compression is used by ODBC and remote command. This enables ODBC applications, iSeries Access Data Transfer, and iSeries Navigator to use compression.

Troubleshooting

Problem Diagnosis

If the connection fails to one of the servers with the message CWBCO1003 rc=10061, that is most likely because the server isn't active or a firewall got in the way.

This can be verified from the NETSTAT *CNN screen on the iSeries system to verify the server is in a *Listen status. The server names are listed in the table on the next page.

If a server isn't listed the STRHOSTSVR command should be ran.

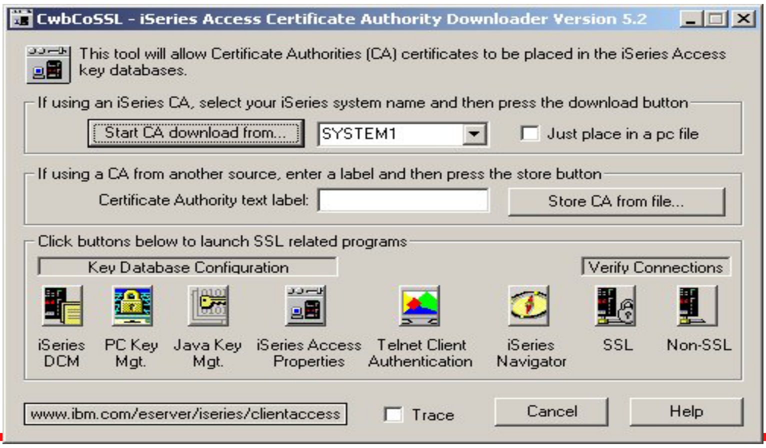
All TCPIP connection messages to iSeries Access for Windows will be displayed using the CWBCO1003 message. Check the online help message file for the meaning of the return codes associated with the message. This will be the same for SSL communications, which will display its return codes with the CWBCO1034 message.

Tools for Troubleshooting

- CWBPING
  - Checks to see if iSeries can be connected to.
  - Checks to see if host servers are up.
  - If problems, messages indicate what is wrong.
- CWBCOTRC
  - Traces communications flows. Output can be sent into IBM Service personnel.
- Detail Trace
  - Traces internal component flows. Output can be sent into IBM Service personnel.

CWBCOSSL tool

- One stop shop for working with SSL
  - CWBCOSSL.EXE installed into Client Access install directory.
- Makes it easier to debug problems with SSL connections.



CwbCoSSL - iSeries Access Certificate Authority Downloader Version 5.2

This tool will allow Certificate Authorities (CA) certificates to be placed in the iSeries Access key databases.

If using an iSeries CA, select your iSeries system name and then press the download button

SYSTEM1

□ Just place in a pc file

If using a CA from another source, enter a label and then press the store button

Certificate Authority text label:

Click buttons below to launch SSL related programs

www.ibm.com/eserver/iseries/clientaccess

□ Trace

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iSeries Access in an Internet Environment

- Getting through firewalls
- NAT
- VPNs (vs. SSL)
- Other security tips

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Firewalls with iSeries Access

- Firewalls selectively filter TCP/IP traffic
- iSeries Access for Windows creates a challenge for firewalls.
- Different ports on the iSeries are used depending on what iSeries Access function is being used.
- Although all firewalls are different, what they have in common is that they can be configured to allow traffic through specific ports.

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Servers and ports used

The following servers are used by iSeries Access for Windows. In addition to the servers listed, the Port Mapper (Port 449) is also used by all functions. However, if the user changes the Connection properties for an iSeries connection so that "Where to look up Remote Port" is set to 'Standard' or 'Local', then the Port Mapper will not be used. In addition, if a DNS server is to be accessed, Port 53 should be made available to the client.

Servers	Ports	Description
Port Mapper	449	Port mapper returns the port number for the requested server
Sign-on	8476 (9476)	Sign-on server is used for every iSeries Access connection to authenticate users and to change passwords
Central	8470 (9470)	Central server is used when an iSeries Access license is required, and also for downloading translation tables
Data Queue	8472 (9472)	Data Queue server allows access to the OS/400 data queues, used for passing data between applications
Database	8471 (9471)	Database server is used for accessing the OS/400 database
Remote Command	8475 (9475)	Remote command server is used to send commands from a PC to an iSeries and for program calls
File	8473 (9473)	File Server is used for accessing any part of the OS/400 file system
Print	8474 (9474)	Print Server is used to access printers known to the iSeries

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Servers and Ports Used (continued)

Servers	Ports	Description
Web Admin	2001 (2010)	Used to access web applications served by the iSeries
DDM	446 (448)	DDM server is used to access data via DRDA and for record level access
Telnet	23 (992)	Telnet server is used to access 5250 emulation
Netserver	137, 138, 139, 8474	iSeries Netserver allows access to iSeries integrated file system from Windows PCs
USF	8480	Ultimedia services is used for multimedia data
LDAP	389 (636)	Provides a network directory service
Mgmt Central	5555 5544 5577 (5566)	Management Central server is used to manage multiple iSeries in a network

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Notes on ports and servers

Note 1: the port number in parenthesis is the one used to connect to the server via SSL (encrypted session).

Note 2: Ports 449, 8xxx, and 9xxx can be started with the STRHOSTSVR *ALL command. The others need to be started individually, or can be set to autostart when TCP/IP is started (as can 449, 8xxx, and 9xxx).

Note 3: Although 8474 is listed next to Netserver, it is only used internally, so does not have to be set in your firewall IP filtering. However, that server (Print server) must be started for Netserver to work properly.

Note 4: If any applications are registered under Application Administration, then the remote command server will be required in addition to what is listed below.

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Servers used by specific functions

iSeries Access Function	**Servers Used**
PC5250 display and printer emulation	Sign-on, Central, Telnet, Remote Command
Data Transfer	Sign-on, Central, Database, Remote Command
Base iSeries Navigator support	Sign-on, Remote Command
All Operations Navigator functions	Sign-on, Remote Command, File, Print, Database, Web Admin, Mgmt Central, USF, Netserver, LDAP,Data Queue
ODBC	Sign-on, Database, Remote Command
OLE DB	Sign-on, Database, DDM, Remote Command, Data Queue
AFP Viewer	Sign-on, Print
iSeries Access Install	Netserver
Incoming Remote Command	Uses no specific server, and iSeries port will vary. PC-side port is 512.
Fax support	Sign-on, Print

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Firewalls and Windows XP Service Pack 2

- By default, once Windows XP SP2 is installed, the Windows Firewall is automatically configured to prevent some incoming connections into the PC. This can affect the following iSeries Access for Windows functions:
  - Incoming Remote Commands
  - Operations Console
  - Management Central
- If you are using these functions, and they stop working once Windows XP SP2 is installed, here are steps you can take…

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Incoming Remote Command

- This uses port 512 by default
- Typical error messages would be:
  - CPE3447 "A remote host did not respond within the timeout period"
  - rexec:connect:Connection timed out
  - rexec: can't establish connection
- Solution:
  - Configure a port exception to allow incoming TCP connections on port 512:

    ```
    C:\> netsh firewall add portopening TCP 512 "rexecd server (exec service, port 512)"
    ```

    - OR -

    Configure an application exception to allow the iSeries Access for Windows Remote Command service (cwbrxd.exe) to accept any incoming connection, regardless of port number or protocol:

    ```
    C:\> netsh firewall add allowedprogram %windir%\cwbrxd.exe "iSeries Access Incoming Remote Command server"
    ```

Operations Console

- Use ports 67 and 2112 for local (async and LAN) connections
- Can use any one of a number of different ports for RCS -> LCS connections
- Typical failures are:
  - When connecting an LCS (local connection), the status may not progress beyond "connecting console".
  - When connecting an RCS (remote connection) to an LCS that has not had all needed firewall exceptions configured, it may fail to connect; or it may connect, but fail to authenticate. The failure reason noted at the RCS may be that the local system is not configured to receive calls.

Operations Console Continued

- Steps to correct:
- Configure a port exception to allow incoming UDP connections on port 67:

```
– C:\> netsh firewall add portopening UDP 67 "bootp server (bootps service, port 67)“
```

- Configure a port exception to allow incoming TCP connections on port 2112 from the local PC (127.0.0.1) only:

```
– C:\> netsh firewall add portopening TCP 2112 "Internal Op Console worker server (port 2112)" ENABLE CUSTOM 127.0.0.1
```

- Configure an application exception to allow the Operations Console program to accept any incoming connection, regardless of port number or protocol:

```
– C:\> netsh firewall add allowedprogram <INSTALL>\cwbopcon.exe "iSeries Access Operations Console (cwbopcon)"
```

Management Central

- Refer to:
- For V5R3: **http://publib.boulder.ibm.com/infocenter/iseries/v5r3/ic2924/info/experience/mcfirewall.pdf**
- For V5R2: **http://publib.boulder.ibm.com/iseries/v5r2/ic2924/info/experience/mcfirewall.pdf**

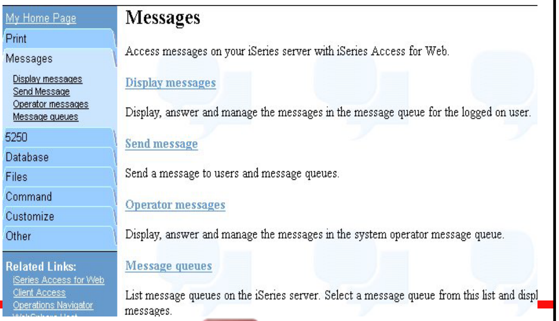
Info on Web

- The preceding information on Windows XP SP2 is also available on the web at:
  - http://www-1.ibm.com/servers/eserver/iseries/access/supportedos.htm
  - Then click on the appropriate link in the Windows XP Professional section

The iSeries Access for Web Alternative

Depending on your needs, if you don't want to mess with all the ports, iSeries Access for Web may be a solution:

- All traffic goes through a single HTTP port.
- SSL will also work using a single HTTPS port.
- All functions run as servlets on the iSeries
- No code to download to the client
- Good set of functions designed for end users:
  - Database access
  - File/Share access
  - printer and print output access
  - Messages
  - 5250 support
  - Customizable user interface
  - Commands



Messages

Access messages on your iSeries server with iSeries Access for Web.

Display messages

Display, answer and manage the messages in the message queue for the logged on user.

Send message

Send a message to users and message queues.

Operator messages

Display, answer and manage the messages in the system operator message queue.

Message queues

List message queues on the iSeries server. Select a message queue from this list and displ messages.

NAT (Network Address Translation)

- Configured through iSeries Navigator
  - Using the same interface used for setting IP packet filtering
- Primary use is to hide addresses when the iSeries is acting as the security gateway (no firewall).
- 3 forms of implementation on the iSeries
  - Masquerade, or hide, NAT
  - Static, or map, NAT
  - Masquerade, or hide "port-mapped", NAT

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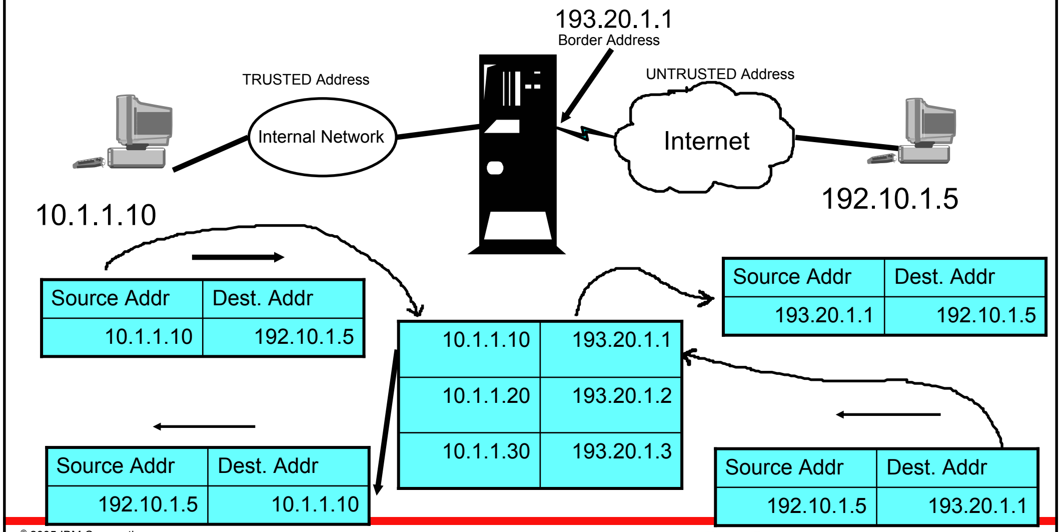
Static NAT

- Used to enable systems on the internet to access servers in your internal network by translating actual inernal server address to a public address.



Source Addr	Dest. Addr
10.1.1.10	192.10.1.5

10.1.1.10	193.20.1.1
10.1.1.20	193.20.1.2
10.1.1.30	193.20.1.3

Source Addr	Dest. Addr
193.20.1.1	192.10.1.5

Source Addr	Dest. Addr
192.10.1.5	10.1.1.10

Source Addr	Dest. Addr
192.10.1.5	193.20.1.1

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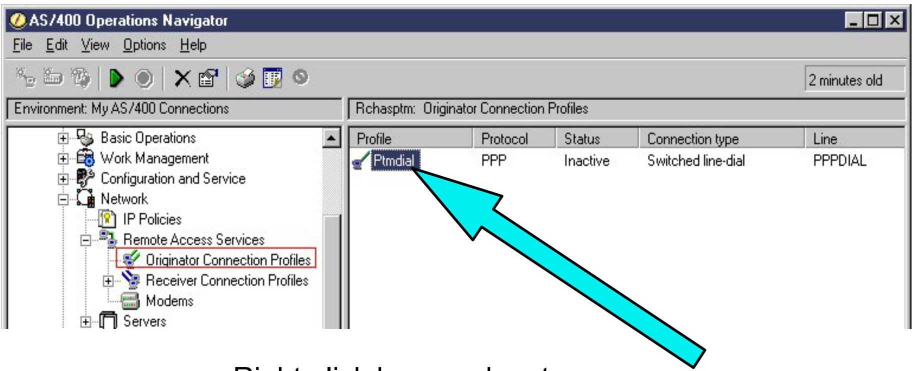
Configuring NAT

- All configuration is done using iSeries Navigator



AS/400 Operations Navigator

Environment: My AS/400 Connections

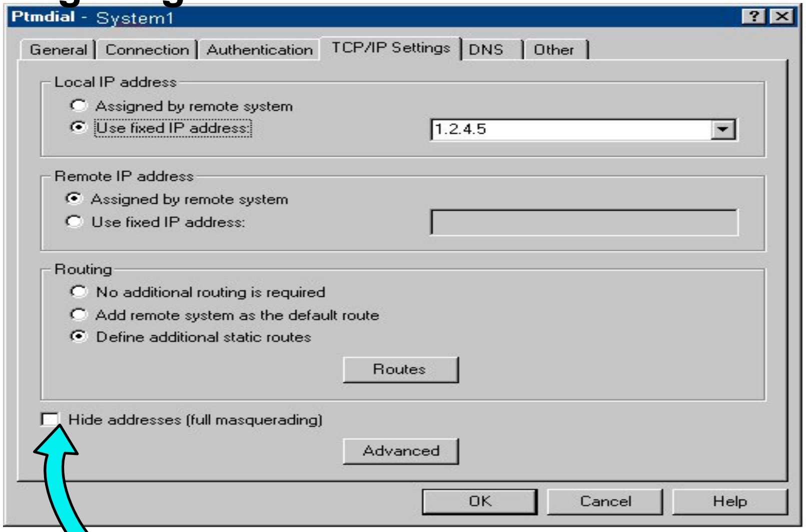
- Basic Operations
- Work Management
- Configuration and Service
- Network
  - IP Policies
  - Remote Access Services
    - Originator Connection Profiles
    - Receiver Connection Profiles
    - Modems
  - Servers

Rchasptm: Originator Connection Profiles

Profile	Protocol	Status	Connection type	Line
Ptmdial	PPP	Inactive	Switched line-dial	PPPDIAL

Right-click here and go to properties

Configuring NAT



Ptmdial - System1

Local IP address

- ○ Assigned by remote system
- ● Use fixed IP address: 1.2.4.5

Remote IP address

- ● Assigned by remote system
- ○ Use fixed IP address:

Routing

- ○ No additional routing is required
- ○ Add remote system as the default route
- ● Define additional static routes

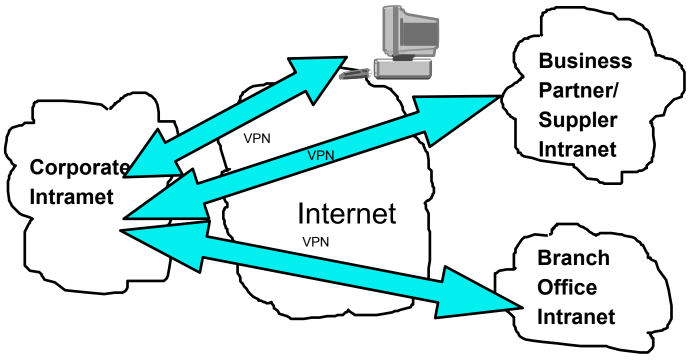
□ Hide addresses (full masquerading)

Click here to turn on hiding

VPN Support

VPNs (Virtual Private Networks)

- VPNs use a combination of a tunneling protocol and encryption to ensure secure communications from a specific client to a specific server.
- A dedicated "pipe" is assigned for all client/server communications.



VPN and encryption

- IPSec is the standard encryption used by VPN.
- The IPSec support is usually built into the VPN client support, which is a separately purchasable and installable program. It is built into Windows 2000 and XP
- Secure Sockets Layer could also be used.

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Windows 2000 VPN Support

- Windows 2000, 2003 and XP have IPSec and L2TP built-in
- RSA signature mode authentication uses digital certificates rather than preshared keys (passwords) for IKE authentication. RSA Signature mode authentication allows us to support Windows 2000/XP clients with dynamically assigned IP addresses.

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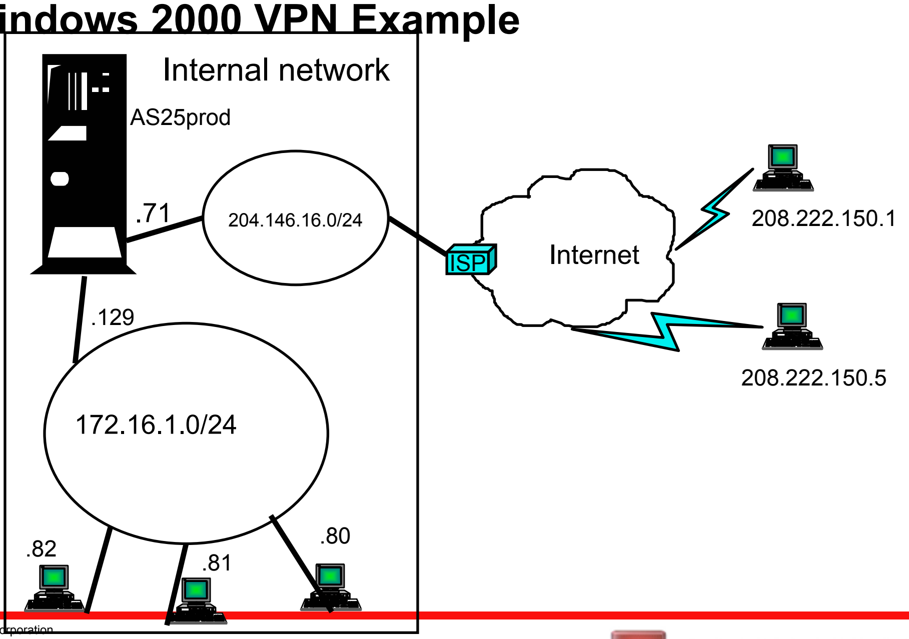
Windows 2000 VPN Example



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Windows 2000: Implementation tasks

1. Verifying the IP connectivity
2. Assigning the Certificate Authority (CA) trust to the OS/400 VPN Key Manager using the OS/400 Digital Certificate Manager (DCM)
3. Creating a server certificate using DCM
4. Creating a VPN connection using the VPN connection wizard
5. Verifying the system-wide responding policy
6. Creating an L2TP Receiver Connection Profile for the iSeries
7. Reviewing the IP packet rules created by iSeries Navigator
8. Obtaining the certificates for the Windows 2000 workstation
9. Configuring the IP Security Architecture for Microsoft Windows 2000
10. Configuring L2TP for Microsoft Windows 2000
11. Start the VPN connection
12. Verifying connectivity on the Windows 2000 workstation
13. Verifying connectivity on the iSeries system

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VPN comparison to SSL

Feature	SSL	VPN
Data Confidentiality	Yes	Yes
Authentication	Server Mandatory. Client Optionally	Yes (VPN Server)
Requires application support	Yes, but could use SSL tunnel	No
Requires host support	Yes	Yes
Services	SSL-enabled servers and clients	All
Client Configuration	Required for each application	Required for VPN server.
Filter Configuration	Individual filter by service (more complex)	IKE+IPSec filters (simpler configuration)
Availability for Windows clients	**Most iSeries SSL-enable servers have a corresponding SSL-enabled SSL client**	Standard in Windows 2000 Lack of support on 95/98/NT

Other Security Tips

General Security Tips

- Only start the TCP/IP servers that are really needed
- Use non-routable private IP addresses in internal network
- Prevent application from using well-known ports
- Turn IP Source Routing off
- Allow IP datagram forwarding only when needed
- Do not leave PPP or SLIP line waiting in answer state.
- Use IP packet filtering on your iSeries
- Use NAT if possible
- Prevent unauthorized use of well-known ports by preventing the users that can use the ports.
- Use iSeries auditing and journaling
- Use exit programs to control access to servers

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Telnet security considerations

- Limit the number of signon attempts (QMAXSIGN system value)
- Set QAUTOVRT to automatically create enough virtual devices. Then set QAUTOVRT to 0.
- Use inactivity time-out (INACTTIMO) parameter on the Telnet configuration to reduce the exposure when a user leaves a telnet session unattended.
- Restrict powerful user profiles from access a telnet session
- Verify QRMTSIGN is set up correctly

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Terminal Server Environment

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What is Terminal Server$_R$?

- A multi-user version of NT 4.0, Windows 2000, and Windows 2003
- Allows multiple, simultaneous client sessions to be run on a single server
- End-users can use Windows$_R$, DOS$_R$, network stations , Unix, or Macs$_R$.
- Follow-on from NCD's WinCenter$_R$ and Citrix's WinFrame$_R$ from NT 3.51$_R$.
- Most standard Windows-based applications don't need modification to run on Terminal Server.

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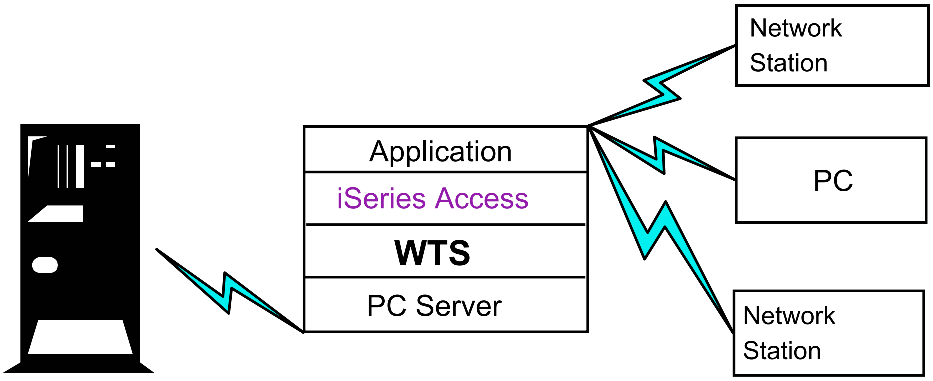
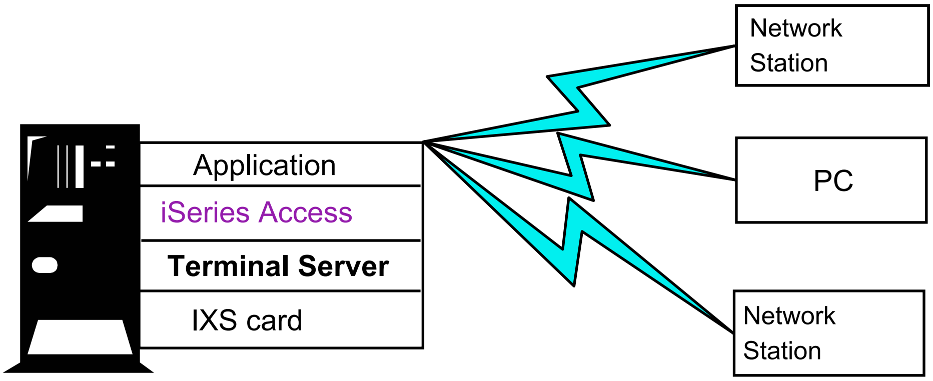
Where iSeries Access fits in

- iSeries AccessR for Windows can run on Terminal Server, either on a standalone server.....



Where Client Access fits in

- Or on an Integrated XSeries Server card in the iSeries



Citrix Metaframe

Metaframe Application Server for Windows

- Thin-Client/Server Computing
  - Applications are deployed, managed, supported, and executed completely on a server
  - Requirements
    - Multi-user operating system
    - Remote presentation services (MetaFrame = ICA)
    - Centralized applications and client management

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Metaframe Heterogeneous Computing Environment Extensions

- Clients
  - Hardware
    - Intel 286,386,486, Pentium
    - Windows-based Terminals
    - Network Computers
    - Through OEM Partners:
    - X.11 based devices
  - Operating Systems
    - Windows 3.1
    - Windows for Workgroups 3.11
    - Windows 95/98
    - Windows NT 3.51/4.0
    - Windows 2000/XP/2003
    - Windows CE
    - DOS
    - UNIX
    - OS/2 Warp
    - Macintosh
    - Java
    - Browser client

- Network Protocol
  - TCP/IP
  - IPX/SPX
  - NetBIOS / NetBEUI
  - SLIP/PPP
  - Direct Asynch

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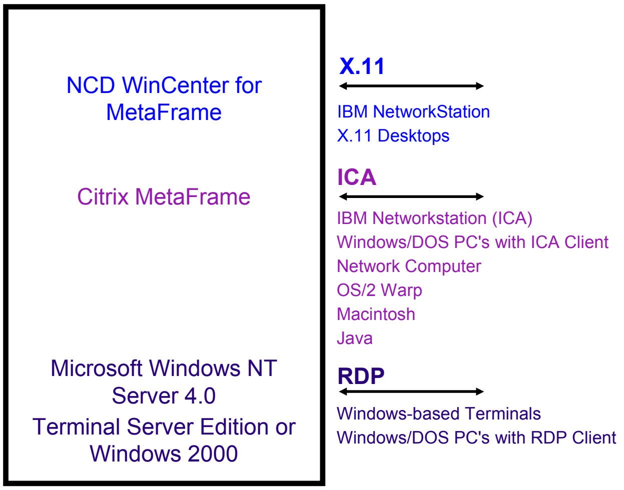
Multi-User NT Summary



NCD WinCenter for MetaFrame

Citrix MetaFrame

Microsoft Windows NT Server 4.0

Terminal Server Edition or Windows 2000

X.11

IBM NetworkStation
X.11 Desktops

ICA

IBM Networkstation (ICA)
Windows/DOS PC's with ICA Client
Network Computer
OS/2 Warp
Macintosh
Java

RDP

Windows-based Terminals
Windows/DOS PC's with RDP Client

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iSeries Access for Windows Installation

- Use the Add/Remove Programs applet in the control panel to invoke the iSeries Access for Windows Setup program.
- Switch to Install Mode using the chgusr command (chgusr /install) prior to invoking setup from the command line. After completing the install, switch back to execute mode using chgusr (chgusr /execute).

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Support Position with iSeries Access for Windows

- Client Access Express and iSeries Access have been tested with most of its functions.
- Functions are supported on Windows clients thru Remote Desktop Protocol (RDP) as well as through Citrix Metaframe.
- Functions include:
  - PC5250 display and print emulation
  - ODBC
  - iSeries Navigator
  - Data Transfer
  - Data Queue
  - Remote Command
  - Policies

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Non-support of Incoming Remote Command

- This function, which allows PC commands to be initiated by the iSeries, is not supported on Terminal Server.
- The current implementation does not allow the routing of the PC command to the proper client workstation.

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Use of NTFS with iSeries Access

- In V5R1, problems accessing directories and registry entries with the NTFS file system were addressed.
- Strategy was to store most user-writable files in " My Documents" directory where it made sense. That is the Microsoft-recommended way to handle.
- Tried not to move existing files when upgrading from an older release to V5R1.

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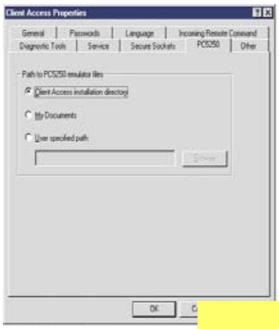
Windows NT, 2000, and 2003 NTFS Users

- By default, PC5250 files still go into the Client Access Install directory.
- Recommend changing to "My documents".
- Always should be writable.
- User can specify any path, but there is no guarantee that it will be writable.



Path to PC5250 emulator files

● Client Access installation directory

○ My Documents

○ User specified path

New NT File System (NTFS) support

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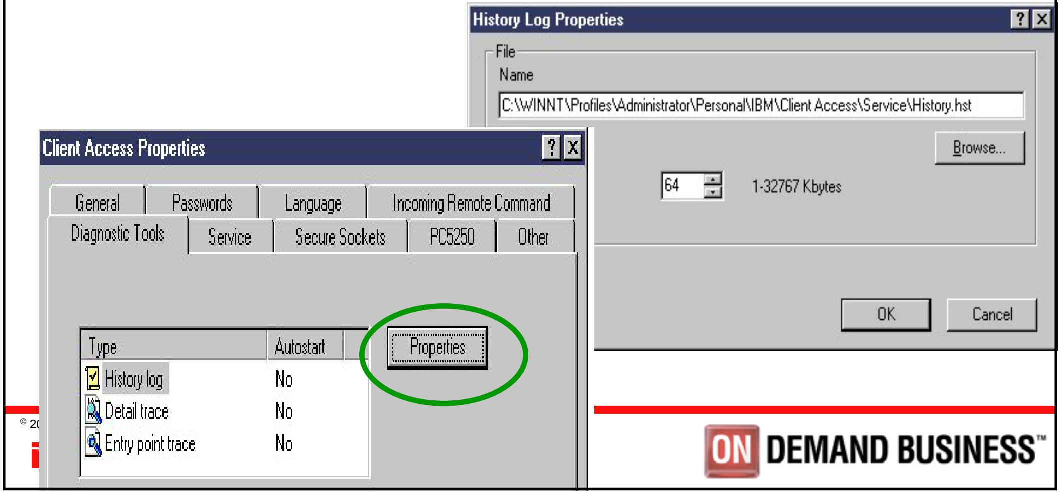
Service Locations

- Service
  - History Log
    - Personal or My Documents location (different for each operating system)
  - Detail and Entry Point Trace files
    - Personal or My Documents location (different for each operating system)
  - Change the locations from Control Panel->Client Acccess, Diagnostics Tools page



History Log Properties

File

Name: C:\WINNT\Profiles\Administrator\Personal\IBM\Client Access\Service\History.hst

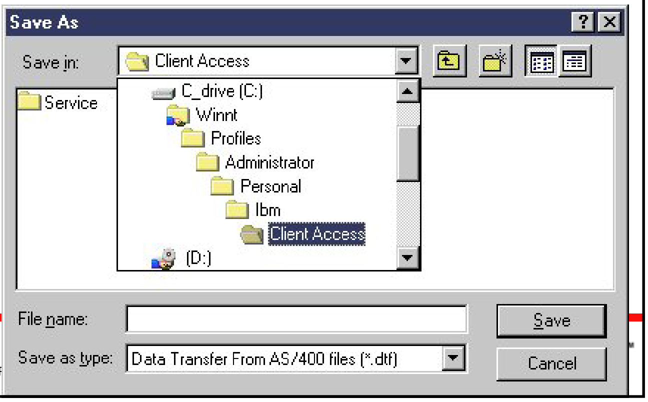
64 1-32767 Kbytes

Client Access Properties

Type	Autostart
History log	No
Detail trace	No
Entry point trace	No

Data Transfer Requests

- Save and Open locations
- Default location
  - Personal or My Documents location (different for each operating system)
- If users have saved to or opened from a different location before, that location will displayed.
- Data Transfer "remembers" this location. This way, users on upgraded systems that have saved transfer requests will continue to see them where they saved before.



Save As

Save in: Client Access

Service

C_drive (C:)
Winnt
Profiles
Administrator
Personal
Ibm
Client Access
(D:)

File name:

Save as type: Data Transfer From AS/400 files (*.dtf)

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Summary

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Summary

- iSeries Access for Windows is supported in a number of different TCP/IP environments
- Can be configured for improved performance and security.
- Access through firewalls requires ports to be opened.
- VPNs are supported on Windows 2000, XP, and 2003 clients
- There are other methods of improving security of your connections
- Terminal Server environment is supported

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References

- Client Access web site: http://www.ibm.com/eserver/iseries/clientaccess/

Apendix: Firewall/NAT example with Client Access

Firewall Configuration Example

- The following information shows how IP Forwarding can be used to configure an iSeries Access connection to an iSeries through a firewall.
- Shows how to permit mobile users on the Internet to access your iSeries behind the Firewall using iSeries Access and Telnet. Since the users are mobile, their IP address is unknown.
- IP filtering is used.
- Assume:
  - 192.168.2.1 is your iSeries Server's IP address
  - 5.5.5.5 is the public IP address that represents your iSeries on the Internet.

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Example - Using NAT to map iSeries address

- From a client behind the firewall, point a web browser at the iSeries, port 2001. For example, if the iSeries is named myas400.priv.abc.com then point the web browser at
  - http://myas400.priv.abc.com:2001
  - Select the "IBM Firewall for AS/400" link
  - Select "Configuration" in the left frame
  - To configure the NAT settings, select "NAT" in the right frame
  - Click on the "Insert" button
  - Choose "MAP" from the list of actions, and then click on the OK button
  - After configuring the NAT settings (as shown below), select "Configuration" in the left frame
  - To configure the filter rules (settings), select "Filters" in the right frame
  - After configuring the filter settings, select "Administration" in the left frame
  - Select "Status" in the right frame
  - Restart both NAT and Filters
- If 5.5.5.5 is NOT the non-secure IP address of your Firewall, then you can do this with 1 simple NAT setting:
  - MAP 192.168.2.1 0 5.5.5.5 0

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Using NAT (continued)

- MAP 192.168.2.1 23 5.5.5.5 23 (For telnet)
- MAP 192.168.2.1 449 5.5.5.5 449 (Port Mapper)
- MAP 192.168.2.1 8470 5.5.5.5 8470 (Central server - Needed whenever PC5250 or Data Transfer is used)
- MAP 192.168.2.1 8471 5.5.5.5 8471 (Database server)
- MAP 192.168.2.1 8472 5.5.5.5 8472 (DataQueues server)
- MAP 192.168.2.1 8473 5.5.5.5 8473 (File server)
- MAP 192.168.2.1 8474 5.5.5.5 8474 (Print server)
- MAP 192.168.2.1 8475 5.5.5.5 8475 (Remote command server)
- MAP 192.168.2.1 8476 5.5.5.5 8476 (Signon server)
- MAP 192.168.2.1 8480 5.5.5.5 8480 (Ultimedia server)
- MAP 192.168.2.1 9480 5.5.5.5 9480 (Ultimedia server with SSL on)
- MAP 192.168.2.1 5555 5.5.5.5 5555 (Management Central server)
- MAP 192.168.2.1 5556 5.5.5.5 5556 (Management Central server with SSL on)

- MAP 192.168.2.1 446 5.5.5.5 446 (DDM server - Sometimes used by Client Access OLE DB support)
- MAP 192.168.2.1 448 5.5.5.5 448 (DDM server with SSL on)
- MAP 192.168.2.1 5110 5.5.5.5 5110 (MAPI server - Needed if these Mail APIs are being used)
- MAP 192.168.2.1 992 5.5.5.5 992 (Telnet with SSL on)
- MAP 192.168.2.1 9470 5.5.5.5 9470 (Central Server with SSL on)
- MAP 192.168.2.1 9471 5.5.5.5 9471 (Database Server with SSL on)
- MAP 192.168.2.1 9472 5.5.5.5 9472 (Dataqueues server with SSL on)
- MAP 192.168.2.1 9473 5.5.5.5 9473 (File Server with SSL on)
- MAP 192.168.2.1 9474 5.5.5.5 9474 (Print Server with SSL on)
- MAP 192.168.2.1 9475 5.5.5.5 9475 (Remote command server with SSL on)
- MAP 192.168.2.1 9476 5.5.5.5 9476 (Signon server with SSL on)

If 5.5.5.5 is the non-secure IP address of your Firewall, then you will need to add these NAT settings. In addition, your router must be configured so that all traffic destined to 5.5.5.5 with subnet mask 255.255.255.255 is routed to the non-secure IP address of your firewall.

More port info

- The only required ports are 8476 and 449. The other ports will only need to be opened if you are using a function that they support. Most users will want to open 23, 449, and 8470 thru 8476.
- Also, be aware that parts of iSeries Navigator, which is part of iSeries Access, also use port 2001 (and 2010 for SSL) to access the Web Admin server. A mapping rule like those above for the scenario when 5.5.5.5 is the non-secure IP address cannot be used for those 2 ports, since this would cause the firewall not to work (it uses those ports). If you need to use those functions of iSeries Navigator from outside of the firewall, then you need to set up your network so that 5.5.5.5 is NOT the non-secure IP address of your Firewall.
- This means acquiring an additional publicly registered IP address that is NOT the same as the firewall's public IP address.

- Then, add the following Filter settings:

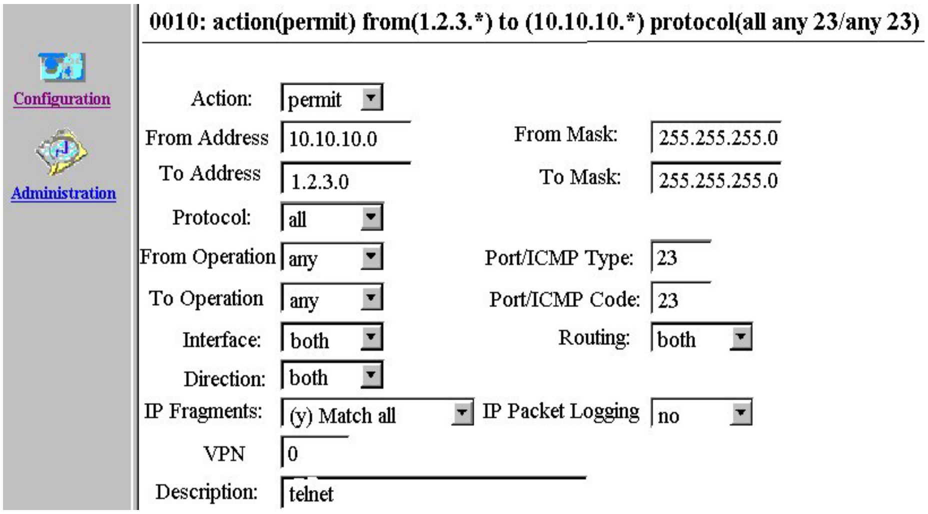
Filter settings - non-secure side

```
################################################################
### Both side settings
################################################################
permit 192.168.2.1 255.255.255.255 0.0.0.0 0.0.0.0 tcp any 0 any 0 both both both f=y l=n t=0 # Permit AS/400 replies
################################################################
### Non-Secure side settings (add filter settings only for the ports you are using (see port descriptions above)
################################################################
permit 0.0.0.0 0.0.0.0 5.5.5.5 255.255.255.255 tcp ge 1024 eq 23 non-secure both inbound f=y l=n t=0 # Permit Telnet access to AS/400
permit 0.0.0.0 0.0.0.0 5.5.5.5 255.255.255.255 tcp ge 1024 eq 449 non-secure both inbound f=y l=n t=0 # Permit Client Access to AS/400
permit 0.0.0.0 0.0.0.0 5.5.5.5 255.255.255.255 tcp ge 1024 eq 8470 non-secure both inbound f=y l=n t=0 # Permit Client Access to AS/400
permit 0.0.0.0 0.0.0.0 5.5.5.5 255.255.255.255 tcp ge 1024 eq 8471 non-secure both inbound f=y l=n t=0 # Permit Client Access to AS/400
permit 0.0.0.0 0.0.0.0 5.5.5.5 255.255.255.255 tcp ge 1024 eq 8472 non-secure both inbound f=y l=n t=0 # Permit Client Access to AS/400
permit 0.0.0.0 0.0.0.0 5.5.5.5 255.255.255.255 tcp ge 1024 eq 8474 non-secure both inbound f=y l=n t=0 # Permit Client Access to AS/400
permit 0.0.0.0 0.0.0.0 5.5.5.5 255.255.255.255 tcp ge 1024 eq 8475 non-secure both inbound f=y l=n t=0 # Permit Client Access to AS/400
permit 0.0.0.0 0.0.0.0 5.5.5.5 255.255.255.255 tcp ge 1024 eq 8476 non-secure both inbound f=y l=n t=0 # Permit Client Access to AS/400
permit 0.0.0.0 0.0.0.0 5.5.5.5 255.255.255.255 tcp ge 1024 eq 8480 non-secure both inbound f=y l=n t=0 # Permit Client Access to AS/400
permit 0.0.0.0 0.0.0.0 5.5.5.5 255.255.255.255 tcp ge 1024 eq 9480 non-secure both inbound f=y l=n t=0 # Permit Client Access to AS/400
permit 0.0.0.0 0.0.0.0 5.5.5.5 255.255.255.255 tcp ge 1024 eq 5555 non-secure both inbound f=y l=n t=0 # Permit Client Access to AS/400
permit 0.0.0.0 0.0.0.0 5.5.5.5 255.255.255.255 tcp ge 1024 eq 5556 non-secure both inbound f=y l=n t=0 # Permit Client Access to AS/400
permit 0.0.0.0 0.0.0.0 5.5.5.5 255.255.255.255 tcp ge 1024 eq 446 non-secure both inbound f=y l=n t=0 # Permit Client Access to AS/400
permit 0.0.0.0 0.0.0.0 5.5.5.5 255.255.255.255 tcp ge 1024 eq 448 non-secure both inbound f=y l=n t=0 # Permit Client Access to AS/400
permit 0.0.0.0 0.0.0.0 5.5.5.5 255.255.255.255 tcp ge 1024 eq 5110 non-secure both inbound f=y l=n t=0 # Permit Client Access to AS/400
permit 0.0.0.0 0.0.0.0 5.5.5.5 255.255.255.255 tcp ge 1024 eq 992 non-secure both inbound f=y l=n t=0 # Permit Client Access to AS/400
permit 0.0.0.0 0.0.0.0 5.5.5.5 255.255.255.255 tcp ge 1024 eq 9470 non-secure both inbound f=y l=n t=0 # Permit Client Access to AS/400
permit 0.0.0.0 0.0.0.0 5.5.5.5 255.255.255.255 tcp ge 1024 eq 9471 non-secure both inbound f=y l=n t=0 # Permit Client Access to AS/400
permit 0.0.0.0 0.0.0.0 5.5.5.5 255.255.255.255 tcp ge 1024 eq 9472 non-secure both inbound f=y l=n t=0 # Permit Client Access to AS/400
permit 0.0.0.0 0.0.0.0 5.5.5.5 255.255.255.255 tcp ge 1024 eq 9473 non-secure both inbound f=y l=n t=0 # Permit Client Access to AS/400
permit 0.0.0.0 0.0.0.0 5.5.5.5 255.255.255.255 tcp ge 1024 eq 9474 non-secure both inbound f=y l=n t=0 # Permit Client Access to AS/400
permit 0.0.0.0 0.0.0.0 5.5.5.5 255.255.255.255 tcp ge 1024 eq 9475 non-secure both inbound f=y l=n t=0 # Permit Client Access to AS/400
permit 0.0.0.0 0.0.0.0 5.5.5.5 255.255.255.255 tcp ge 1024 eq 9476 non-secure both inbound f=y l=n t=0 # Permit Client Access to AS/400
```

Filter settings - Secure side

```
################################################################
### Secure side settings (add filter settings only for the ports you are using (see port descriptions above)
################################################################
permit 0.0.0.0 0.0.0.0 192.168.2.1 255.255.255.255 tcp ge 1024 eq 23 secure both outbound f=y l=n t=0 # Permit Telnet access to AS/400
permit 0.0.0.0 0.0.0.0 192.168.2.1 255.255.255.255 tcp ge 1024 eq 449 secure both outbound f=y l=n t=0 # Permit Client Access to AS/400
permit 0.0.0.0 0.0.0.0 192.168.2.1 255.255.255.255 tcp ge 1024 eq 8470 secure both outbound f=y l=n t=0 # Permit Client Access to AS/400
permit 0.0.0.0 0.0.0.0 192.168.2.1 255.255.255.255 tcp ge 1024 eq 8471 secure both outbound f=y l=n t=0 # Permit Client Access to AS/400
permit 0.0.0.0 0.0.0.0 192.168.2.1 255.255.255.255 tcp ge 1024 eq 8472 secure both outbound f=y l=n t=0 # Permit Client Access to AS/400
permit 0.0.0.0 0.0.0.0 192.168.2.1 255.255.255.255 tcp ge 1024 eq 8473 secure both outbound f=y l=n t=0 # Permit Client Access to AS/400
permit 0.0.0.0 0.0.0.0 192.168.2.1 255.255.255.255 tcp ge 1024 eq 8474 secure both outbound f=y l=n t=0 # Permit Client Access to AS/400
permit 0.0.0.0 0.0.0.0 192.168.2.1 255.255.255.255 tcp ge 1024 eq 8475 secure both outbound f=y l=n t=0 # Permit Client Access to AS/400
permit 0.0.0.0 0.0.0.0 192.168.2.1 255.255.255.255 tcp ge 1024 eq 8476 secure both outbound f=y l=n t=0 # Permit Client Access to AS/400
permit 0.0.0.0 0.0.0.0 192.168.2.1 255.255.255.255 tcp ge 1024 eq 8480 secure both outbound f=y l=n t=0 # Permit Client Access to AS/400
permit 0.0.0.0 0.0.0.0 192.168.2.1 255.255.255.255 tcp ge 1024 eq 9480 secure both outbound f=y l=n t=0 # Permit Client Access to AS/400
permit 0.0.0.0 0.0.0.0 192.168.2.1 255.255.255.255 tcp ge 1024 eq 5555 secure both outbound f=y l=n t=0 # Permit Client Access to AS/400
permit 0.0.0.0 0.0.0.0 192.168.2.1 255.255.255.255 tcp ge 1024 eq 5556 secure both outbound f=y l=n t=0 # Permit Client Access to AS/400
permit 0.0.0.0 0.0.0.0 192.168.2.1 255.255.255.255 tcp ge 1024 eq 446 secure both outbound f=y l=n t=0 # Permit Client Access to AS/400
permit 0.0.0.0 0.0.0.0 192.168.2.1 255.255.255.255 tcp ge 1024 eq 448 secure both outbound f=y l=n t=0 # Permit Client Access to AS/400
permit 0.0.0.0 0.0.0.0 192.168.2.1 255.255.255.255 tcp ge 1024 eq 5110 secure both outbound f=y l=n t=0 # Permit Client Access to AS/400
permit 0.0.0.0 0.0.0.0 192.168.2.1 255.255.255.255 tcp ge 1024 eq 992 secure both outbound f=y l=n t=0 # Permit Client Access to AS/400
permit 0.0.0.0 0.0.0.0 192.168.2.1 255.255.255.255 tcp ge 1024 eq 9470 secure both outbound f=y l=n t=0 # Permit Client Access to AS/400
permit 0.0.0.0 0.0.0.0 192.168.2.1 255.255.255.255 tcp ge 1024 eq 9471 secure both outbound f=y l=n t=0 # Permit Client Access to AS/400
permit 0.0.0.0 0.0.0.0 192.168.2.1 255.255.255.255 tcp ge 1024 eq 9472 secure both outbound f=y l=n t=0 # Permit Client Access to AS/400
permit 0.0.0.0 0.0.0.0 192.168.2.1 255.255.255.255 tcp ge 1024 eq 9473 secure both outbound f=y l=n t=0 # Permit Client Access to AS/400
permit 0.0.0.0 0.0.0.0 192.168.2.1 255.255.255.255 tcp ge 1024 eq 9474 secure both outbound f=y l=n t=0 # Permit Client Access to AS/400
permit 0.0.0.0 0.0.0.0 192.168.2.1 255.255.255.255 tcp ge 1024 eq 9475 secure both outbound f=y l=n t=0 # Permit Client Access to AS/400
permit 0.0.0.0 0.0.0.0 192.168.2.1 255.255.255.255 tcp ge 1024 eq 9476 secure both outbound f=y l=n t=0 # Permit Client Access to AS/400
```

Example of setting filter rules



0010: action(permit) from(1.2.3.*) to (10.10.10.*) protocol(all any 23/any 23)

Action:	permit		
From Address	10.10.10.0	From Mask:	255.255.255.0
To Address	1.2.3.0	To Mask:	255.255.255.0
Protocol:	all		
From Operation	any	Port/ICMP Type:	23
To Operation	any	Port/ICMP Code:	23
Interface:	both	Routing:	both
Direction:	both		
IP Fragments:	(y) Match all	IP Packet Logging	no
VPN	0		
Description:	telnet		

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