IBM Network Station

Version 2 Release 1

Windows Application Access

(ICA)

IBM Copyright

Citrix Copyright and acknowledgment

Contents

Introduction and Overview

The ICA Client is a V2R1 IBM Network Station application that provides access to a Windows session running on high-performance Citrix servers. Once the connection to a Citrix server is established, you can access Windows applications and work with files in a similar way to working on a local PC.

The ICA Client displays the Windows session in a separate window on the IBM Network Station screen, and is fully integrated with your other IBM Network Station applications. You can cut and paste text and graphics between Windows applications in the ICA Client window and your other applications.

Your IBM Network Station's mouse and keyboard can be used with Windows applications in the usual way, and you can set up key mappings to enable you to enter PC keys not available on your IBM Network Station's keyboard.

Citrix Servers

Citrix WinFrame and Citrix MetaFrame are fast and easy Windows NT application server solutions for delivering Windows applications to the IBM Network Station and other desktops, including PCs, Apple Macintosh computers, X terminals, and UNIX workstations. Citrix server software usually runs on a high-performance PC, and a single-processor Citrix server will typically support up to 15 simultaneous client connections.

The Citrix server communicates with the ICA Client over a standard TCP/IP network connection.

Independent Computing Architecture (ICA) protocol

ICA is a general-purpose presentation services protocol owned by Citrix Systems. Conceptually similar to the UNIX X-Windows protocol, ICA allows an application's user interface to execute with minimal resource consumption on a client machine, while application logic executes on the WinFrame or MetaFrame multiuser application server.

The ICA protocol has been specially designed for transmitting Windows graphical display data, and keyboard and mouse input, over a network connection.

The key features of the ICA protocol that help to achieve the high performance are:

- Intelligent command and object-specific compression

- Intelligent caching of Windows objects including bitmaps, brushes, glyphs, and pointers

- Run length encoding

The ICA protocol is designed to be client independent.

More information about the ICA protocol is available from the Citrix World Wide Web page at http://www.citrix.com/

The ICA Remote Application Manager[1]

The ICA Remote Application Manager presents a list of the ICA connection definitions you have set up, and allows you to initiate an ICA connection to a Citrix Server.

Once you are connected to a Citrix server, the ICA Client application presents the ICA Client window to handle communication with the Citrix server and provide the display, keyboard, and mouse interface between the server and your IBM Network Station.

The ICA Remote Application Manager also allows you to create new connection definitions, or edit the definitions of existing connections.

For each connection you can define the following features:

Window size

The ICA Client window size can be set to one of four predefined window sizes, full screen size, or a custom size (up to your IBM Network Station display size).

Number of colors

The ICA Client window can be set to 256 or 16 colors. This is an ICA Protocol limitation. At some future time, the ICA Protocol may be extended to support more than 256 colors, e.g., 16-bit TrueColor.

In addition, you can define default values for the window size and window colors, which are then used as the default for all new connection definitions.

Color approximation

Color approximation can be used if the IBM Network Station is running in PseudoColor mode. In this mode, differences in the palettes used between the ICA Client (and the Windows applications it displays) and the IBM Network Station may cause an annoying flashing that occurs when switching context. The ICA Client's color approximation scheme eliminates this flashing by using colors from the local desktop palette to display the ICA Windows sessions.

True Color

The ICA Client maps ICA protocol colors (16 or 256) to true color. Running the IBM Network Station in TrueColor mode provides the most compatible color management if the ICA Client is sharing screen space with any other program (including the window manager and desktop).

Remote Applications and Load Balancing

The ICA Client supports two types of connections: ICA connections and remote applications.

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[1] The ICA Remote Application Manager has also been referred to as the "ICA Chooser" or the "ICA Connection Manager". This document will use the name that Citrix gave it, i.e., the "ICA Remote Application Manager".

An ICA connection allows a user to access a Citrix desktop. The user can run any applications available on the desktop, in any order.

A remote application is a predefined application and its associated environment (for example directories and initialization files) that execute on a remote Citrix server.

There are several ways to define a remote application:

- By defining an ICA connection that directly executes an application.

- By defining an ICA connection that points to a published application created using the Application Configuration utility on the Citrix server. This method also supports load balancing.

See Chapter 5, "Application Publishing," in the MetaFrame Administrator's Guide , or the WINFRAME System Guide for more information about application publishing.

The Load Balancing Services can be used with multiple Citrix servers to provide load balancing capabilities. Citrix load balancing support lets you define a remote application that runs on a predefined set of Citrix servers. When a user launches the remote application, the Citrix load balancing software uses a tunable algorithm to select a server to execute the application. The load balancing parameters are configurable and can be tuned to provide maximum throughput and system availability.

Another advantage of load balancing is increased reliability. By configuring a pool of servers that are capable of running your users' applications without your users ever needing to know which server is actually running the application, you can easily bring servers off-line for maintenance without affecting application availability, or add more servers for increased performance.

See Chapter 5, "Application Publishing," in the MetaFrame Administrator's Guide, or the WIN FRAME System Guide for more information about load balancing.

Printer mapping

You can redirect printing jobs from applications you are running on a Citrix server and print them to a printer connected to your IBM Network Station.

The ICA Client supports any spooled printer available from your IBM Network Station, as long as the associated printer driver is installed on the Citrix server.

Audio mapping

Audio mapping allows your client computer to play sounds generated by applications running on the Citrix server. ICA Client audio support includes configurable sound quality levels that allow you to customize sound quality based upon the amount of bandwidth available.

NT Server Audio

- Wave sound only (server may convert other formats to Wave)
- Midi music not supported
- CD audio not supported
- no sound card is required on the server

Supported audio characteristics

- linear PCM

- 8 and 16 bit
- 8, 11, 22, and 44 Khz
- mono and stereo

Device control (e.g. volume) is not supported

COM port mapping

Client COM port mapping allows devices attached to the client computer's COM ports to be used from ICA sessions on a Citrix server. This allows local serial devices to be used by applications running on the Citrix server.

Data compression

Data compression reduces the amount of data transferred across the ICA session to increase performance over bandwidth-limited connections.

Caching

Caching stores commonly used graphical objects such as icons in a local cache on the client computer to reduce the amount of data sent over the connection. Caching commonly used bitmaps tends to increase performance, especially for bandwidth-limited connections.

The ICA Client employs both an internal transient cache and an external persistent cache.

Since the IBM Network Station does not have a hard disk, the external persistent cache is implemented as an in-memory file system which is created each time the Network Station is re-booted. By default, this in-memory file system is not enabled due to the finite amount of memory in the Network Station. (In this release, persistent caching must be enabled by following the ICA persistent caching directions in the /.profile file.)

Drive Mapping

Client drive mapping makes selected directories on the IBM Network Station available to the users when they connect to a Citrix server. Access login and read/write permissions can be set for each selected directory.

Encryption

ICA sessions can be encrypted using 40, 56 or 128 bit encryption keys. The ICA Client must connect to an Citrix Server that supports an equal or higher number of bits for the encryption key.

The ICA Client

When connecting to a description, the ICA Remote Application Manager created a new process and starts an instance of the ICA Client program. Using information passed by the ICA Remote Application Manager, the ICA Client connects to a Citrix server and establishes an ICA session.

The ICA Client creates a new window in which the Windows application is presented.

External Interfaces

There are two executable programs in the IBM Network Station ICA package.

- The **ICA Remote Application Manager** program is a graphical user interface for selecting ICA servers or Windows applications to connect to. It presents connection records that it creates and connection records created by Network Station Manager. When a connection is initiated, the ICA Client program is fork'ed and exec'ed.

- The **ICA Client** program connects to a Citrix application server and establishes a session. The application window is presented within an X11 window on the Network Station.

On-line help associated with panels, commands

The User Interface section has been translated into HTML and is presented when the user selects Help-->View detailed help.

Help files are located in the `$MRIPATH/$LANG/ICAClient` directory.

Features Added to ICA by IBM

The IBM Network Station ICA Client is derived from the Citrix ICA Client for Linux SDK. The following features were added to the IBM Network Station ICA Client:

- The ICA Client command line was extended to provide:
    - Compatibility with previous releases
    - List of ICA browsers to try
    - Flash support
    - ICA .ini configuration file statements can be specified
    - Debug and trace options to collect information from the field

- Adapted bitmap caching to a diskless work station

- Added a host connect dialog if the ICA Client is started without any ICA server or browser information.

- Added problem determination tools (additional trace options, data collection tools)

- Added support for 19 languages (HTML help text, app-defaults, keyboards).

- Removed words or sections from HTML help and from run time dialogs that did not apply to the IBM Network Station. For example, client program update, bitmap persistent cache size and location, competitor keyboard definitions.

- Added full screen option to dialogs.

- Added Alt-Tab and Alt-Shift-Tab to the HotKeys dialog.

- Added KIOSK support (single application, full screen, no window borders)

- Added Registry support to access ICA connection records, keyboard layout and, in the case of flash, ICA command line parameters.

- Added hook to Actlogin to get current user's password and pass to NT login screen. Added decoding algorithms for Actlogin passwords.

- Added syslog support.

- Added DES and RC5 encryption using 40, 56 and 128 bit keys.

- Added and enabled ICA unique icon pixmaps.

- Detailed HTML help can be launched from the Help->View Detail button. The HTML help is displayed in a light weight HTML browser.

Using the ICA Remote Application Manager

The following sections describe how to use the ICA Remote Application Manager to connect to a Citrix server from your IBM Network Station:

Quick Start

To connect to a Citrix server you need to have a user name and password set up for you on the server, and you need to know the name of the server and domain.

To run the ICA Remote Application Manager

From the launch bar, select **Host Access ---> ICA Remote Application Manager**.

From the command line, type the following command:

```
/usr/lib/ICAClient/wfcmgr   <Return>
```

where /usr/lib/ICAClient is the directory in which you installed the ICA Remote Application Manager.

Note: If the ICA Remote Application Manager has not been installed in the default installation directory, ensure that the environment variable ICAROOT is set to point to the actual installation directory.

The ICA Remote Application Manager window is displayed:

To define a connection

Note: If Network Station Manager had been used to define ICA connection entries, they will be displayed. You may go to "**To open a connection**" or continue with defining a new connection entry.

1. Choose **New...** from the **Entry** menu, or click the New Entry icon.

   The **Properties** dialog box is displayed to allow you to define a new connection:

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2. If required, edit the **Description** to describe the connection definition you are creating.

    The description is used to identify the connection definition in the **ICA Remote Application Manager** window.

3. Select to connect to a Citrix **Server** or to a **Published Application** and then choose a Citrix server or published application from the pull-down list.

4. If you want to log in as a specific user enter the appropriate details in the **Username**, **Domain**, and **Password** fields.

    Alternatively, you can leave the fields blank, in which case you are prompted for them, if necessary, when you connect.

5. Click **OK** to create a connection definition containing the properties you have specified.

The **ICA Remote Application Manager** window shows the connection definition you have created:

To open a connection

Once you have created a connection file with the appropriate network connection properties set up, you can connect to the Citrix server as follows:

Double-click the name of the connection definition you want to open in the ICA Remote Application Manager window.

Alternatively, you can select the name of the connection definition and choose **Connect** from the **Entry** menu, or click the **Connect** button:

This connects to the server specified in the connection file with the user name and password details you have entered in the connection definition.

Connecting to Citrix MetaFrame Servers

If you have not specified a user name or password in the connection file, you are prompted to enter them if they are required by the server:
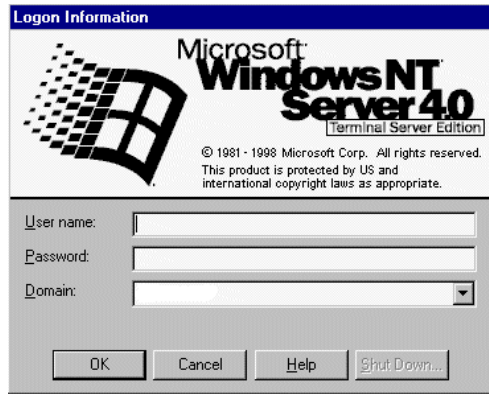
After a short delay the Windows desktop is displayed in a window on your IBM Network Station:
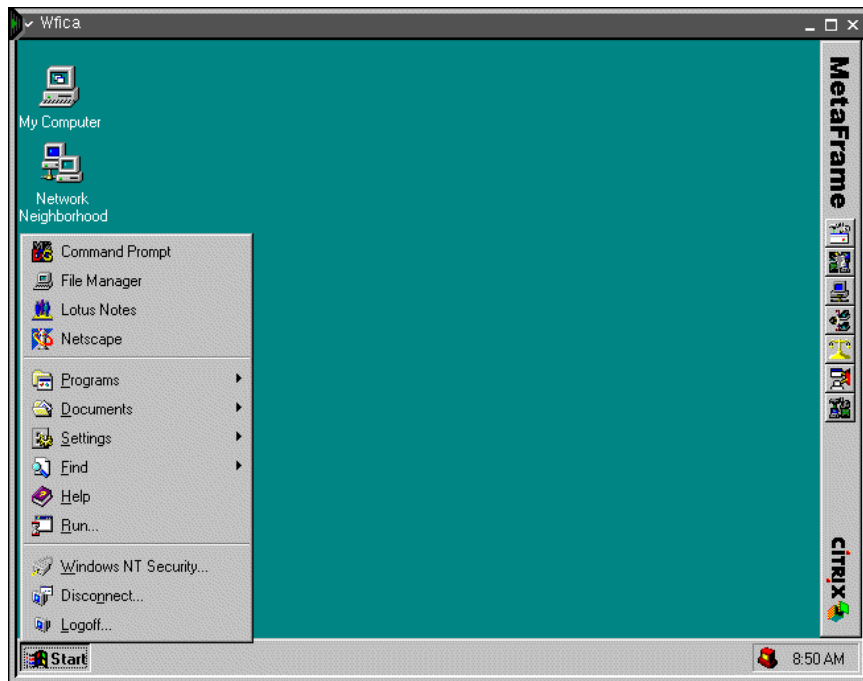
To log off from Windows

Choose **Logoff...** from the Windows **Start** menu or, if your connection is set up to run an application, choose **Exit** from the application's **File** menu. These two methods close the ICA session and terminates the ICA Client.

To disconnect from Windows

Choose **Disconnect...** (if available) from the Windows **Start** menu.

This leaves your session open on the Citrix server, and you can resume work where you left off next time you log on to the server with the same user name and password.

When you reconnect, the server forces the ICA Client window to be the same size and number of colors as in the original session.

Connecting to Citrix WinFrame Servers

If you are connecting to a Citrix WinFrame server, then the login window
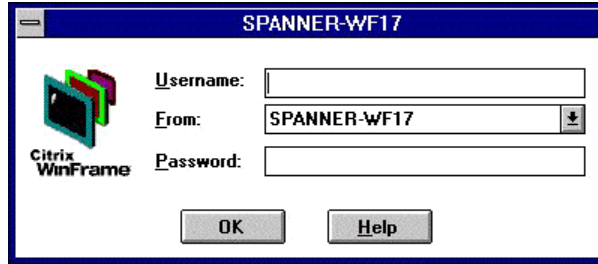
and desktop window
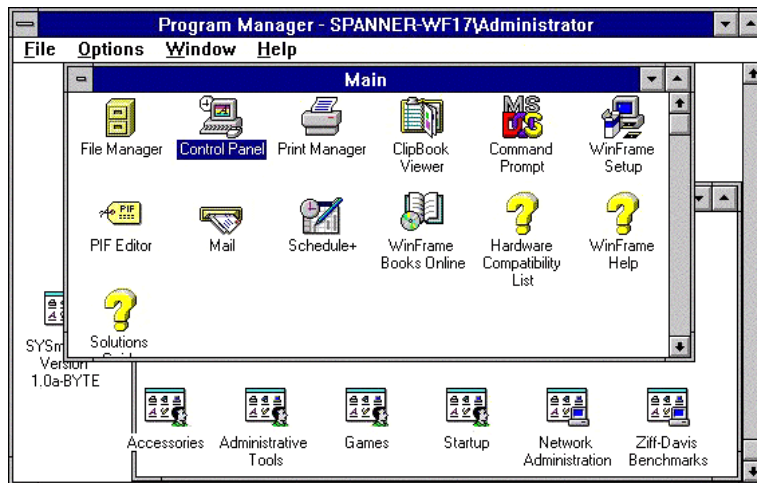
have a different appearance.

To log off from Windows

Choose **Log off...** from the Windows Program Manager **File** menu or, if your connection is set up to run an application, choose **Exit** from the application's **File** menu. These two methods close the ICA session and terminates the ICA Client.

Alternatively, choose **Close** (if available) from the Window menu. This leaves the ICA Client application running so that you can open another session, if you want.

To disconnect from Windows

Choose **Disconnect...** (if available) from the Windows Program Manager File menu.

To quit from the ICA Remote Application Manager

Choose **Exit** from the **Entry** menu.

This leaves any connections to Citrix servers open.

To edit an existing connection definition

You can edit existing connection definitions, or create new connection definitions, in the ICA Remote Application Manager window.

When you create a new connection definition, the default window size and window color settings are those specified by the **Settings...** command on the **Option** menu.

For information about the properties you can specify for each connection see the section Editing connections.

To edit an existing connection definition

1. Select the name of the connection you want to edit in the ICA Remote Application Manager window.

2. Choose **Properties...** from the **Entry** menu, or click the **Properties** button.

    The **Properties** dialog box shows the current properties of the selected connection.

3. Edit the properties you want to change, and then click **OK** to close the **Properties** window.

Menus

The ICA Remote Application Manager has three menu buttons for managing connection entries, setting options and presenting help.

Entry menu
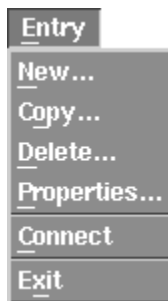
New...

Opens the Properties dialog box to allow you to create a new connection definition.

Copy...

Duplicates the currently selected connection definition so that you can create a new connection based on an existing one.

Delete...

Deletes the currently selected connection definition.

Properties...

Displays the Properties dialog box to allow you to view or edit the properties of the currently selected connection definition.

Connect...

Makes a connection to the Citrix server specified in the currently selected connection definition.

Exit

Exits from the ICA Remote Application Manager application.

Option menu

Settings...

Displays the **Settings** dialog box to allow you to specify the default window settings for new connection definitions, and enter other general settings.

Help menu

About ICA Client...

Displays the ICA Client version number.

View detail help

Display help text for ICA Client.

Properties dialog box

This section explains in detail how to use the ICA Remote Application Manager to create and edit connection definitions, giving you total control over your access to Citrix servers.

To display the connection properties

1. Select the name of the connection you want in the ICA Remote Application Manager window.

2. Choose **Properties...** from the **Entry** menu, or click the **Properties** button:

The **Properties** dialog box shows the current properties of the selected connection:

Network	description, server name, user name, password, domain
Connection	compression, caching, sound, encryption
Window	number of colors, color mapping, window size
Application	application name, working directory

Network

Allows you to select a Citrix server or published application, and the user logon parameters. The user name, domain, and password should match those set up on the specified Citrix server.

If you do not provide these parameters you are prompted for them each time you connect.

Connection
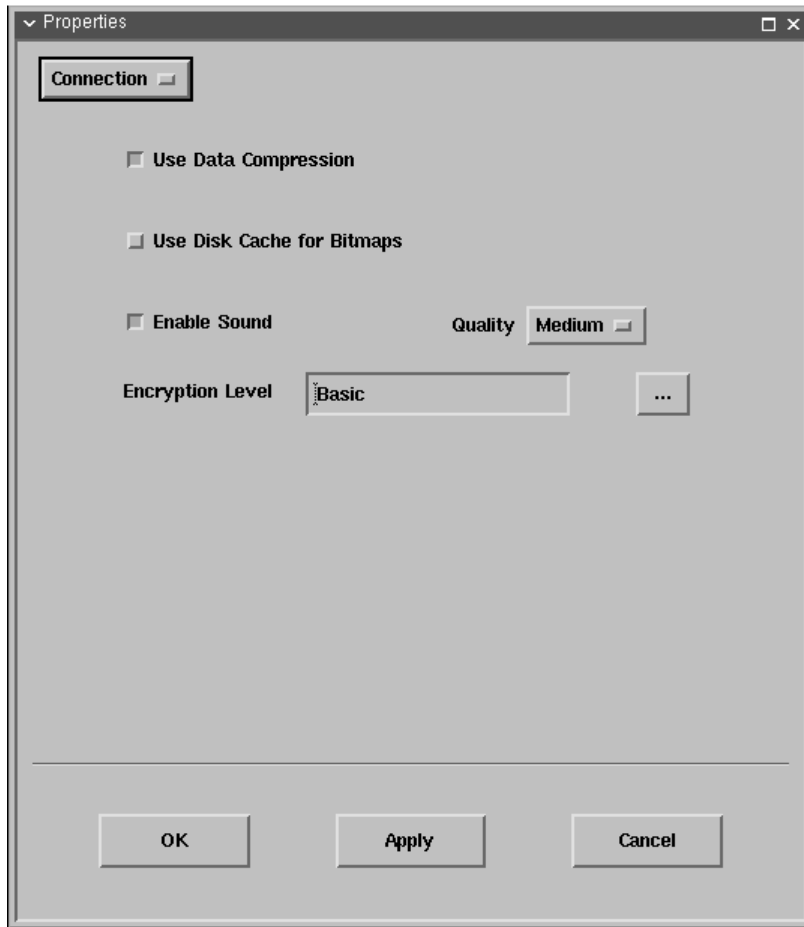
Select **Use Data Compression** to reduce the amount of data transferred across the ICA session. This requires additional processor resources to compress and decompress the data, but can increase performance over bandwidth-limited connections.

Select **Use Disk Cache for Bitmaps** to enable persistent caching of frequently used icons and bitmaps. The persistent cache is always cleared when the IBM Network Station is re-booted. Internal caching is not affected by this option. Persistent caching must be enabled by following the ICA persistent caching directions in the /.profile file.

Select **Enable Sound** to enable sound support. Select **High**, **Medium**, or **Low** quality depending on the available bandwidth. The higher the sound quality, the more bandwidth is used.

Select the **Encryption Level** for the ICA session. The default level is Basic. Strong encryption is available using RCA RC5 for 40, 56 and 128 bit session keys. Select RC5 128-bit Login Only to use encryption only during authentication. Selecting RC5 encryption disables automatic login to the Citrix server.

Window
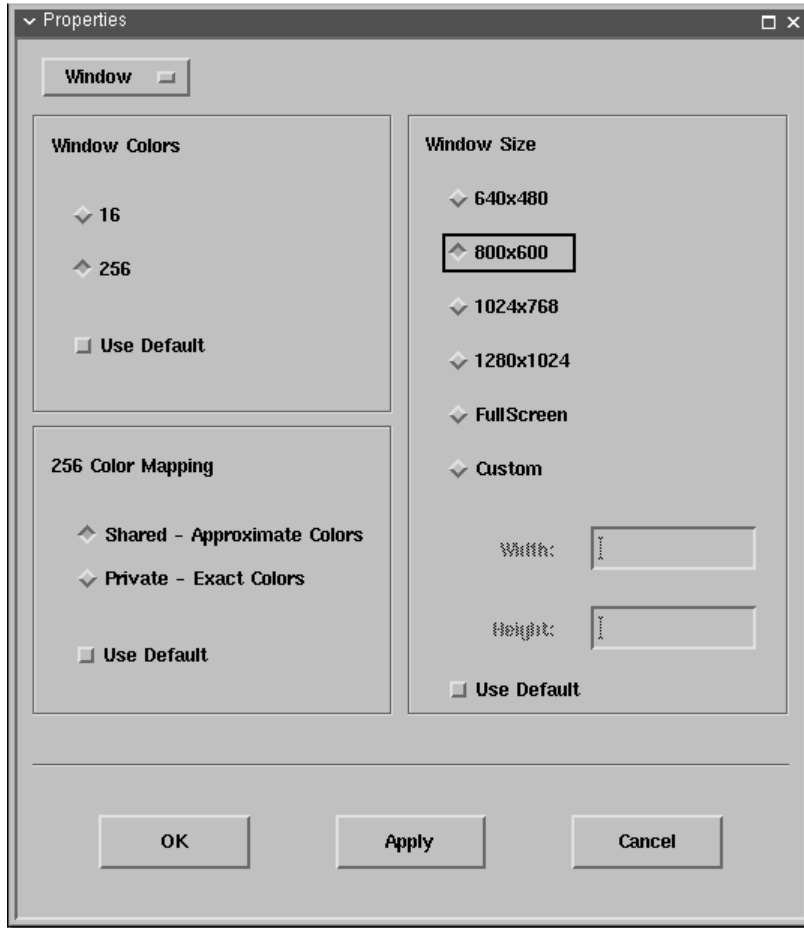
Window Size allows you to select one of four standard window sizes, full screen, or a custom size.

Window Colors allows you to set the number of windows colors to 16 or 256.

256 Color Mapping allows you to set up 256 color sessions to use approximate or exact colors. Use Approximate Colors to eliminate color flashing when switching context. Note that if other applications have allocated all 256 colors the client will fall back to using a private colormap.

Select **Use Default** to use the default window size, window colors or 256 color mapping setting specified with the **Settings...** command on the **Option** menu; refer to <u>Window Settings....</u>

Application
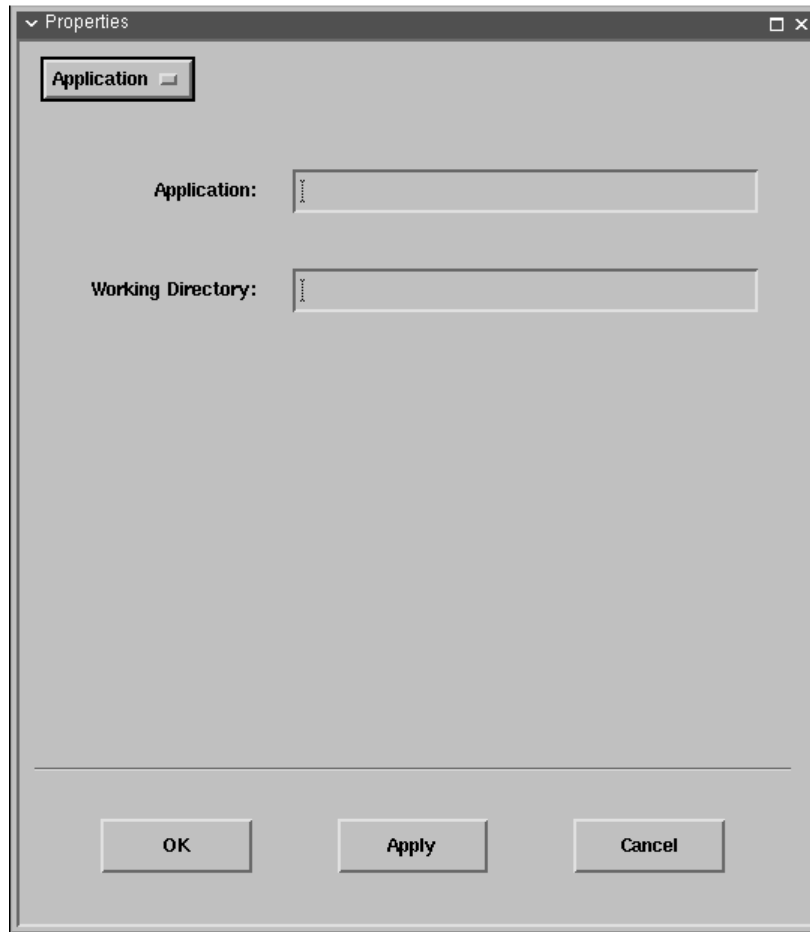
Allows you to specify the pathname of an application to be run after connecting to the Citrix server. For example, to run Microsoft Word automatically after connecting to the Citrix server you might enter:

```
C:\WINWORD\WINWORD.EXE
```

If you specify an application then you do not see the Windows desktop, and the connection is closed when you quit from the application.

The **Working Directory** allows you to specify the pathname of a working directory to be used with the application.

Note: If you have selected to connect to a published application the Application dialog box will not be available.

Settings dialog box

The **Settings** dialog box allows you to specify the default window settings used when you create a new connection file. It also allows you to enter a Citrix name server TCP/IP address.

To display the **Settings** dialog box choose **Settings...** from the Option menu.

Option
Settings...

It contains the following panels:

Preferences   keyboard type and layout, alert sounds, com port devices

Window   default color and size choices

Server Location   server groups, server lists

HotKeys   <Alt><F1-F12>, <Alt><Tab>

Drive Mapping   enable/read/write, directory to drive mapping

Preferences
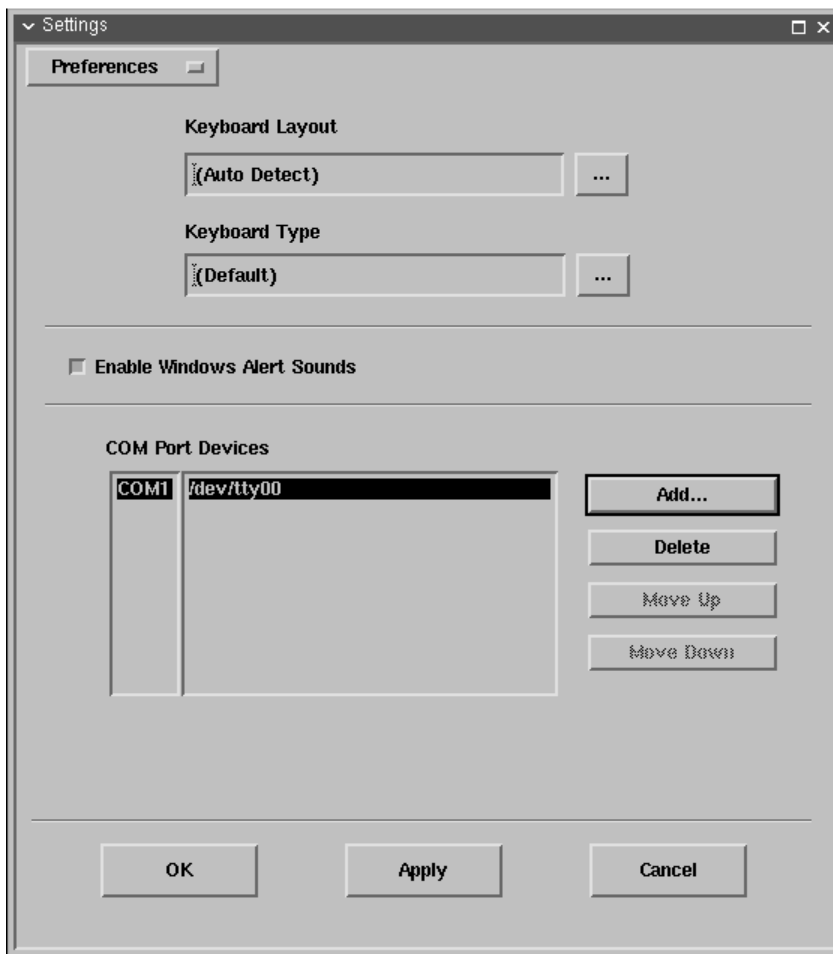
Keyboard Layout specifies the keyboard layout used by the ICA Client. If **(Auto Detect)** is selected then the ICA Client will automatically detect and use the keyboard layout configured by the IBM Network Station Boot Monitor. If **(User Profile)** is selected than the Citrix server specifies the keyboard layout based on the user's Citrix server profile. If neither of these options are suitable, one of the following explicit keyboard layouts can be selected:

Danish	**French**	**Italian**
Dutch	**French (Belgian)**	**Norwegian**
Dutch (Belgian)	**French (Canadian 1988)**	**Portuguese**
English (UK)	**French (Canadian 1992)**	**Portuguese (Brazilian)**
English (US)	**French (Swiss)**	**Spanish**
English (US ISO)	**German**	**Spanish (Latin America)**
Finnish	**German (Swiss)**	**Swedish**

Keyboard Type specifies the keyboard type to be used with the ICA Client. Select **(Default)**.

Enable Windows Alert Sounds if selected causes Windows alert sounds to be played using the IBM Network Station sound system.

COM Port Devices allows bi-directional mapping of IBM Network Station serial devices, e.g. /dev/tty00, to Citrix Server COM ports.

Window
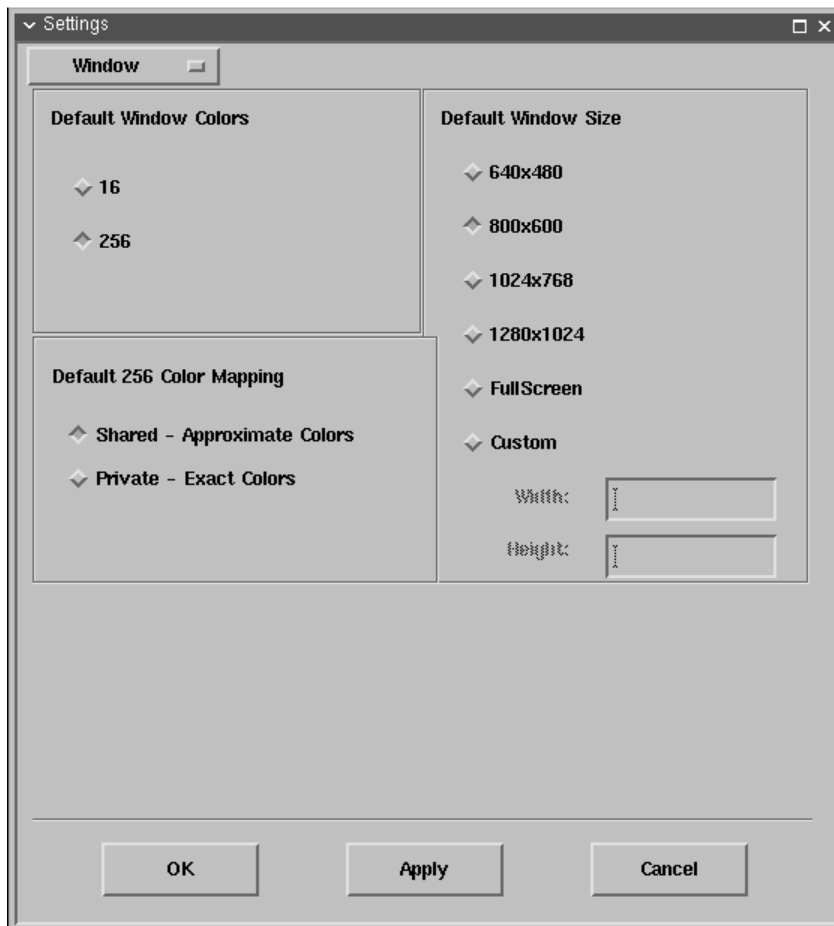
These settings are used as the default for all new connection files.

Window Size allows you to select one of four standard window sizes, full screen, or a custom size.

Window Colors allows you to set the number of windows colors to 16 or 256.

256 Color Mapping allows you to setup 256 color sessions to use approximate or exact colors.

Server Location
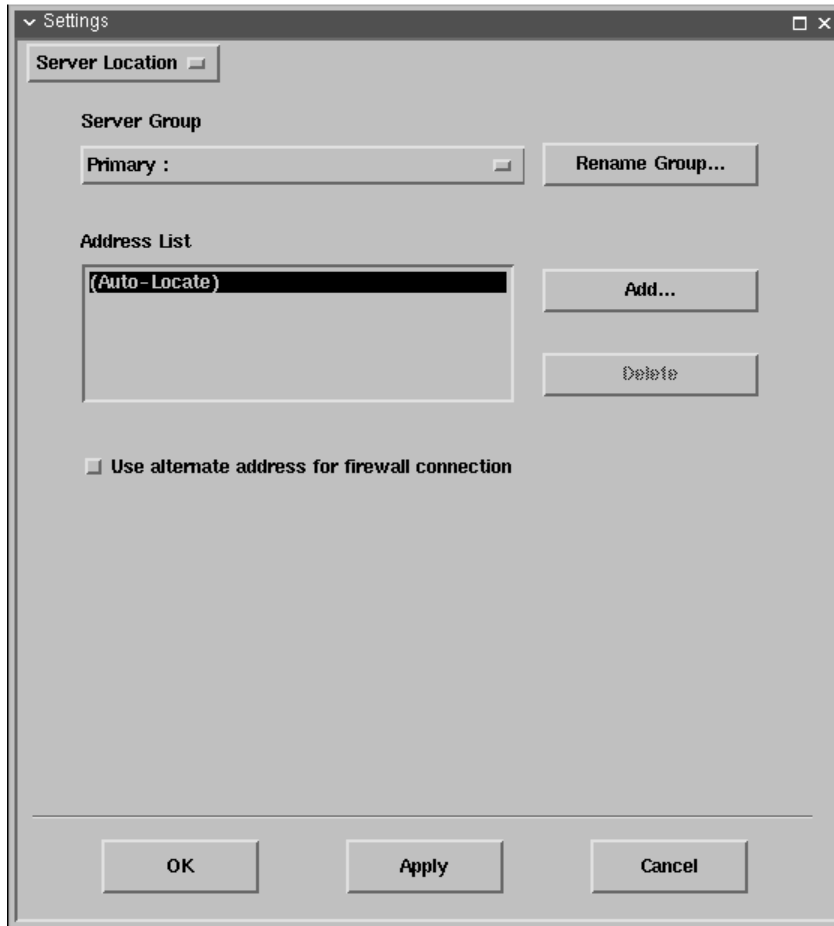
Provides a more redundant method for locating the Master ICA Browser. The Master ICA Browser is queried to create a list of all Citrix servers and published applications on the network.

If **(Auto-Locate)** is specified in the **Address List** box, the ICA Client broadcasts a Get Nearest Citrix server packet. The first Citrix server to respond is queried for the address of the ICA Master Browser server.

If Citrix servers are specified in the **Address List** box, the ICA Client sends a request for the address of the Master ICA Browser to each of the servers listed in the Primary group. If there is no response, requests are sent to each of the servers listed in the Backup 1 group. If there is no response from the Backup 1 group, requests are sent to the servers listed in the Backup 2 group.

Some network configurations use routers or gateways to filter broadcast packets. Specifying Citrix servers allows the ICA Master Browser to be located on these types of networks.

Note: If the Master ICA Browser cannot be located, you can connect to Citrix servers directly by specifying the TCP/IP address as the server location.

The **Use alternate address for firewall connection** feature is used to browse for Citrix servers or published applications that are inside a firewall from a client machine that is outside the firewall. The firewall and the Citrix servers must be configured to map the internal network addresses of Citrix servers to external internet addresses. Enter the external internet addresses in the Address List.

Do not use the **Use alternate address for firewall connection** check box except on the advice of your administrator.

Hotkeys
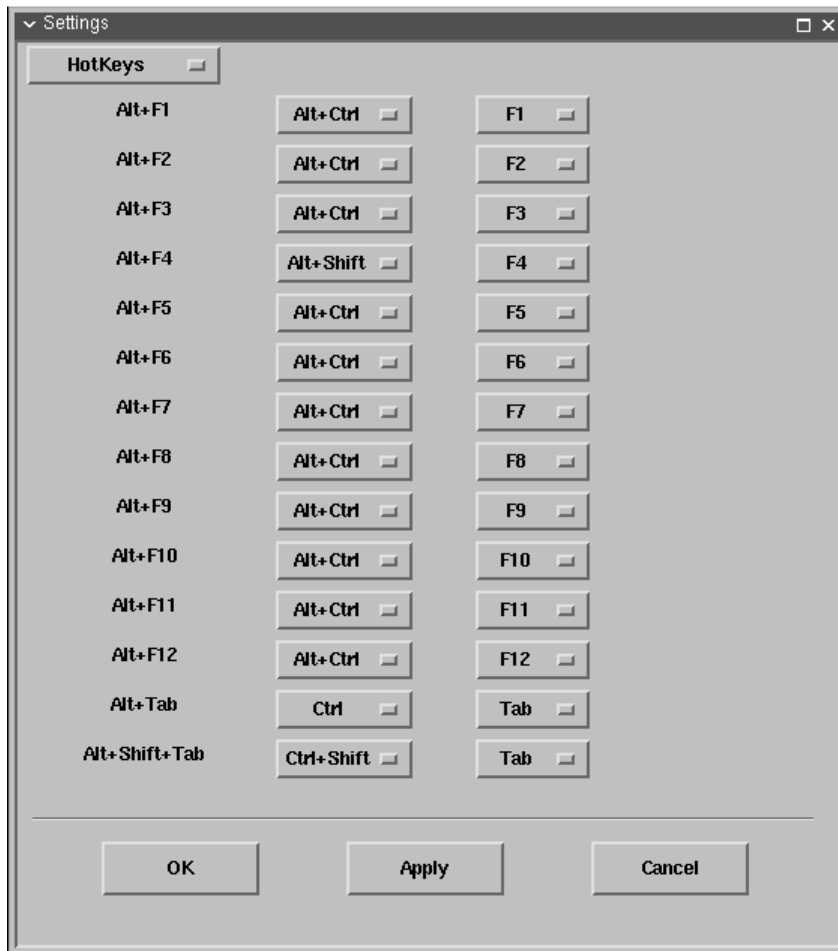
Allows you to define alternative key combinations for the hot keys. The following table shows the hot keys reserved for X Windows and the default alternative key combinations.

X Window Hot Key Combination	Default Alternative Key Combination
<Alt><F1> to <Alt><F12>	<Alt><Ctrl><F1> to <Alt><Ctrl><F12>
<Alt><Tab>	<Ctrl><Tab>
<Alt><Shift><Tab>	<Ctrl><Shift><Tab>

You can change the definitions by selecting alternative keys from the pop-up menus.

Any <Alt> key combinations not used by your X Window manager can be used as normal within your Citrix session.

In addition, the key combination <Ctrl><Alt><Enter> can be used to produce the PC key combination <Ctrl><Alt><Delete>.

Drive mappings
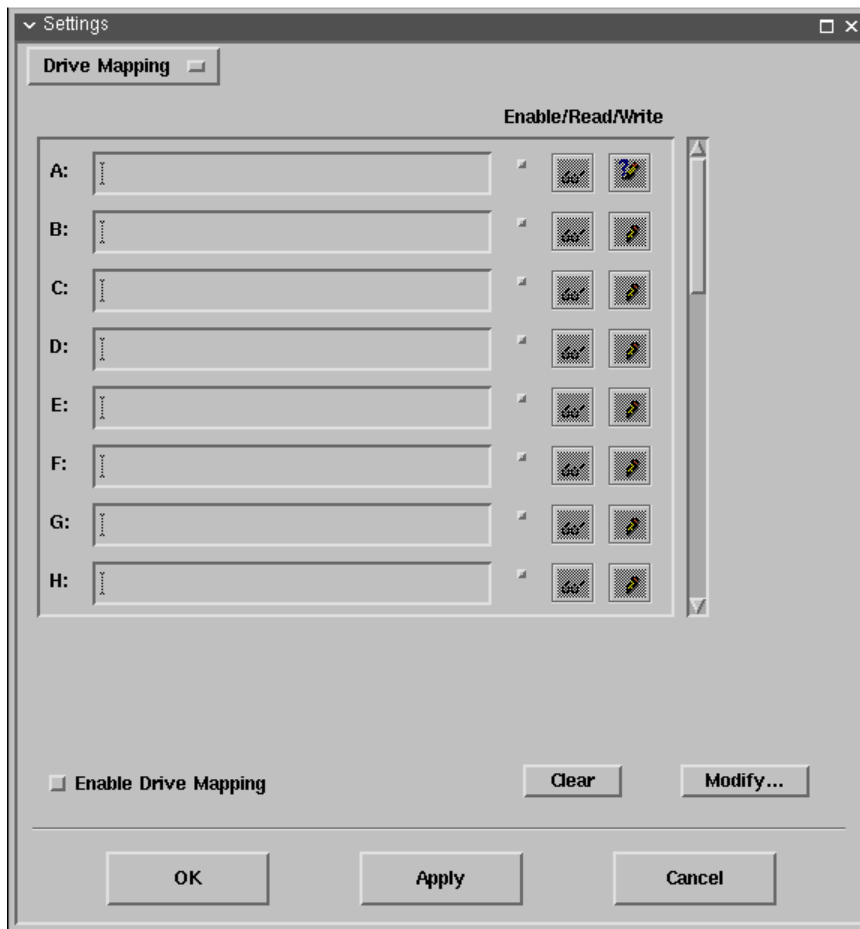
You can configure the ICA Client so that you can access any directory mounted on your IBM Network Station, including CD-ROMs, from the Citrix server session as PC drive letters.

After changing drive mapping settings you need to log off and reconnect to the Citrix server for the changes to take effect; simply disconnecting is not sufficient.

To display the drive mappings:

1. Choose **Settings?** from the **Option** menu.

2. Choose **Drive Mapping** from the **Settings** dialog box to display the **Drive Mapping** panel.

3. For each Windows NT drive letter the Drive mapping list shows the disk or path name of the IBM Network Station directory mapped to the drive, and the **Enable/Read/Write** access.

To map a Citrix server drive to a directory on your IBM Network Station:

1. Select the drive you want to map; for example **B:**.

   If the drive you have mapped is not available on the Citrix server, the directory you have specified is mapped to another free drive letter.

2. Click **Modify** to change the drive mapping. A file selection dialog is displayed to allow you to select the IBM Network Station directory to map.

3. Select the directory you want to map to and click **OK**. The directory is shown in the Drive mapping list.

To enable access to a specific drive, click the check box next to the corresponding drive.

To change the access to a drive, click the appropriate read/write icons corresponding to the drive. The meaning of the icons areas follows:

Icon	Meaning
👓	Read access
👓?	Prompt for read access on first access per session
✗	No read access
✏	Write access
?✏	Prompt for write access on first access per session
✗	No write access

To enable drive mapping, select **Enable Drive Mapping**. This enables drive mapping for all your connection definitions.

Depending on the setup of the server, your mapped drives may or may not be immediately available. They may also be mapped to different server drive letters than those you specified in the **Drive Mapping** panel, because the drives you specified have already been assigned by the server.

To find out the current status of your mapped drives, once connected to the Citrix server, open the **File Manager** and click the drive letter pull-down menu in the top left of the **File Manager** window.

This displays which local or client drives are mapped to which server drives.

Client drives are shown in the format `\\Client\drive` where drive is the drive letter specified in the **Drive Mapping** panel.

If a drive you specified in the **Drive Mapping** panel is not shown in this list you can connect it to a server driver letter as follows:

1. In the **File Manager** select **Connect Network Drive?** from the **Disk** menu.

2. In the **Connect Network Drive** dialog box, select the server drive you want to map the client drive to in the **Drive** pull-down menu.

3. If you want to have this drive available to you each time you log into this server, ensure that the **Reconnect at Logon** box is checked.

4. Double-click the **Client Network** icon in the **Shared Directories** list, then click the appropriate client icon for your IBM Network Station directory. This displays a list of the available local drives, previously set up in the **Drive Mapping** panel.

5. Select the drive you want to map to the selected server drive and click **OK**. Your local drive will now be available.

Repeat the above steps for each of the local drives you wish to attach to the server drives.

File naming conventions

As UNIX is a case sensitive file system and Windows NT is case insensitive, problems may occur if you use UNIX files within the ICA Client session whose names are identical except for their case. For example, ReadMe and README.

In such circumstances, although Windows NT displays the names correctly in a file listing, when a file is referred to, for example as a link in an HTML file, the first file found is used.

It is therefore recommended that any files you intend to use within the ICA Client session have unique names.

Using the ICA Client

The following sections describe how to use the ICA Client to connect to a Citrix server from your IBM Network Station.

Quick Start

To connect to a Citrix server you need to have a user name and password set up for you on the server, and you need to know the name of the server and domain.

To run the ICA Client

Type the following command at the command line prompt:

```
/usr/lib/ICAClient/wfica  <Return>
```

where `/usr/lib/ICAClient` is the directory in which you installed the ICA Client.

Note: If the ICA Client has not been installed in the default installation directory, ensure that the environment variable ICAROOT is set to point to the actual installation directory.

The ICA Client host name dialog is displayed:

Enter the host name of the Citrix server that you want to connect to and press the Enter key or click the OK button.

After connecting to the Citrix server, the Citrix server may prompt you to enter your user id and password. After a short delay the Windows desktop is displayed in a window on your IBM Network Station.

Copying and pasting text and graphics

The ICA Client automatically transfers text and graphics between the X Windows and Windows clipboards, so that you can copy or cut and paste freely between X Windows and Windows applications.

To copy text or graphics from Windows to X Windows

1. Select the text or graphic you want to copy from the Windows application.

2. Choose **Copy** from the Windows application's **Edit** menu. The text or graphic is copied to the Windows clipboard.

3. Switch to the X application you want to use.

4. Choose the appropriate command from the X application to paste in the text or graphic you copied.

To copy text or graphics from X Windows to Windows

1. Select the text or graphics you want to copy.

2. Choose the appropriate command from the X application to copy the text or graphics. The text or graphic is copied to the Windows clipboard.

3. Switch to the ICA Client.

4. Choose **Paste** from the **Edit** menu of the Windows application to paste the text or graphic.

Connecting to Local Printers

With the ICA Client you can print to any spooled printer available from your IBM Network Station. Such printers might be connected to the parallel port or the serial port.

To print to a local printer in WinFrame

1. In the Main program group double-click the **Print Manager** icon.

   In the **Printer Manager** window you should see an icon, or open dialog box, for a network printer with a name similar to *workstation#printer* where *workstation* is the IBM Network Station name and *printer* is the IBM Network Station name for the printer.

2. If no client printer is available, select **Connect to Printer?** from the **Printer** menu.

3. Double-click the **Client Network** icon in the **Shared Printer** list.

4. Double-click the **Client** icon.

5. Select the client printer icon, which will have a name similar to *workstation#printer*, and click **OK**.

6. If you want this printer to be your default printer select it in the **Default** menu at the top of the **Printers** window.

To print to a local printer in MetaFrame

1. Click **Start** on the taskbar, point to **Settings**, then click **Printers** on the submenu.

   In the **Printers** window you should see an icon for a network printer with a name similar to *workstation#printer*, where *workstation* is the IBM Network Station name and *printer* is the IBM Network Station name for the printer.

2. If no client printer is available, double-click the **Add Printer** icon in the **Printers** window to run the **Add Printer Wizard**.

3. Click the **Network** printer server then click **Next**.

4. Double-click Client Network, and double-click **Client**.

5. Select the printer from the list displayed, and click **OK**.

   Spooled printers available on the IBM Network Station have a name similar to
   workstation#printer.

6. If you want this printer to be your default printer, click **Yes** then click **Next**.

7. Click **Finish** to complete the process.

Note: The ICA Client printer support is not bi-directional. This means that the printer cannot
answer or originate messages.

Connecting to Local Serial Devices

With the ICA Client you can use serial devices attached to any of the COM ports on your IBM
Network Station.

To map a client COM port

1. Start the ICA Client and logon to the Citrix server.

2. Start a DOS command prompt: ...

   At the prompt type net use ***comX: \\client\comZ***: where *X* is the number of the COM port
   on the server (ports 1 through 9 are available for mapping) and *Z* is the number of the client
   COM port you want to map to. Press ENTER.

3. To confirm the operation, type net use at the prompt. The list that appears contains mapped
   drives, LPT ports and mapped COM ports.

To use this COM port in a session on a Citrix server, install your device to the mapped name.
For example, if you map COM1 on the client to COM5 on the server, install your COM port
device on COM5 during the session on the server. Use this mapped COM port as you would a
COM port on the client computer.

The IBM Network Station ICA Client maps the four virtual serial ports as follows:

Series 300 and Series 1000

- com1 maps to the   base serial port on the planar board   /dev/tty00
- com2 maps to the   A plug on the multiport serial card   /dev/tty01
- com3 maps to the   B plug on the multiport serial card   /dev/tty02
- com4 maps to the   C plug on the multiport serial card   /dev/tty03
- (ICA can not use the   D plug on the multiport serial card)

Series 2200

- com1 maps to the   base serial port on the USB Serial adapter   /dev/utty00

Series 2800

- com1 maps to the   serial port 1 on the planar board   /dev/tty00
- com2 maps to the   serial port 2 on the planar board   /dev/tty01
- com3 maps to the   A plug on the multiport serial card   /dev/tty02
- com4 maps to the   B plug on the multiport serial card   /dev/tty03

- (ICA can not use the   C and D plugs on the multiport serial card)

Note: COM port mapping is not TAPI-compatable. TAPI devices cannot be mapped to client COM ports.

Connecting over the Internet

With the ICA Client, you can connect to a Citrix server over the Internet.

The World Wide Web provides users with easy access to a Citrix server. The following example shows how to connect to a Citrix server from a World Wide Web browser such as Netscape Navigator.

First you need to set up mailcap and MIME files for Netscape Navigator or Mosaic so that **.ica** files start up the ICA Client executable, **wfica**.

In $HOME, create or modify the .mailcap file and add the line:

```
application/x-ica; wfica -file %s
```

The application **wfica** must be in the path. The %s indicates that the full filename of the **.ica** file is passed to the application.

In $HOME, create or modify the .mime.types file and add the line:

```
application/x-ica ica
```

Command Line Parameters

There are two executable programs in the IBM Network Station ICA package.

- The ICA Remote Application Manager program, **wfcmgr**, is a graphical user interface for selecting ICA servers or Windows applications to connect to. It presents connection records that it creates and connection records created by Network Station Manager. When a connection is initiated, the ICA Client program is fork'ed and exec'ed.

- The ICA Client program, **wfica**, connects to a Citrix application server and establishes a session. The application window is presented within an X11 window on the Network Station.

ICA Remote Application Manager - wfcmgr

There is a small set of command line parameters for the ICA Remote Application Manager. The -noupdate parameter is the only parameter that is anticipated to be used by the IBM Network Station product. The other parameters came with the Citrix source code.

```
Usage: wfcmgr [options]

Where [options] are:

 -help                    Show this message
 -noupdate                Configuration/Connection updates not allowed
 -desc[ription] <string>  Connection description from connection file
 -icaroot <directory>     Installation directory (full path name)
 -file <filename>         Connection file name
```

–help   the usage text (as shown above) is sent to the console.

–noupdate   when this option is specified, updates to the connection file and/or the configuration file are not allowed.

–description <*text*>   the full text from the Description field of the connection definition dialog. If this argument is not specified, then the first description in the [ApplicationServers] section of the appsrv.ini file will be used.

–file <*name*>   the fully qualified file name of the file that contains the connection description to be used. If the HOME environment variable is defined then the default file name is $HOME/.ICAClient/appsrv.ini. Otherwise, the default file name is /usr/lib/ICAClient/config/appsrv.ini.

–icaroot <*directory*>   the fully qualified directory where the ICA client package was installed. If not specified then the ICAROOT environment variable is accessed to get the directory. If neither the -icaroot argument nor the ICAROOT environment variable are used to define the install directory, then by default, it is /usr/lib/ICAClient.

The command line parameters are scanned multiple times. During the first scan, any tokens that match the "${NAME}" format will be replaced by the value of the environment variable called "NAME". Typically, this is used by NSM to pass the current user's password by specifying

${PASSWORD}. It is the responsibility of the system manager to insure that the environment variable exists.

ICA Client - wfica

The Release 3.0 AF ICA command line parameters will continue to be supported. This allows for Release 3.0 ICA migration. The command line parameters have precedence over the .ini files.

```
Usage: wfica [ica_options] [ns_options [-- <application>]]

Where [ica_options] are:

 -help                    Show this message
 -version                 Show version information
 -quiet                   Suppress connection dialogs
 -desc[ription] <string>  Connection description from connection file
 -file <filename>         Connection file name
 -protocolfile <filename> Protocol file name
 -clientfile <filename>   Configuration file name
 -icaroot <directory>     Installation directory (full path name)

And [ns_options] are:

 -s[erver] <name>         NT server name
 -b[rowser] <namelist>    NT browser name list <name[:name: ... :name]>
 -u[sername] <name>       NT login user name
 -p[assword] [<password>] NT login password
 -do[main] <name>         NT domain name
 -na[me] [<name>]         NT CLIENTNAME
 -c[olor] <16 | 256>      NT number of colors
 -en[cryption] <level>    NT encryption level <basic | login | 40 | 56 |
 128>
 -g[eometry] <WxH±X±Y>    X11 window <Width x Height ± X_off ± Y_off>
 -g[eometry] fullscreen   X11 window full screen
 -ti[tle] <title>         X11 Window title
 -ca[che] <size>          Cache size in Kbytes
 -<keyword> <value>       Override .ini files with "keyword=value"
 -- <application>         Initial program OR published application
```

ICA Options

–help   the usage text (as shown above) is sent to the console.

–version   the following message is sent to the console:

```
IBM Network Station ICA Client
Version 2.0  (Build dd/mm/yyyy - hh:mm:ss)
Copyright International Business Machines Corp. 1999
All rights reserved

Citrix ICA Client for Unix
Version 3.00.15
Copyright 1998-1999 Citrix Systems, Inc.
All rights reserved
```

–quiet	connection dialogs will not be presented to the user. By default, the ICA client will present a "connecting to" dialog followed by a "connected to" dialog. Both of these dialogs are informational and require no response by the user.
–description *<text>*	the full text from the Description field of the connection definition dialog.
	Either **–description** or **–server** or **– <application>** must be specified. If neither of these parameters are specified then the user will be prompted for a server name.
–file *<name>*	the fully qualified file name of the file that contains the connection description to be used. If the HOME environment variable is defined then the default file name is `$HOME/.ICAClient/appsrv.ini`. Otherwise, the default file name is `/usr/lib/ICAClient/config/appsrv.ini`.
–protocolfile *<name>*	the fully qualified file name of the file that contains the protocols supported by the ICA client. By default, the file name is `/usr/lib/ICAClient/config/module.ini`. This is a system configuration file and not meant to be modified.
–clientfile *<name>*	the fully qualified file name of the file that contains the options and defaults for all connection descriptions. If the HOME environment variable is defined then the default file name is `$HOME/.ICAClient/wfclient.ini`. Otherwise, the default file name is `/usr/lib/ICAClient/config/wfclient.ini`.
–icaroot *<directory>*	the fully qualified directory where the ICA client package was installed. If not specified then the ICAROOT environment variable is accessed to get the directory. If neither the **–icaroot** argument nor the ICAROOT environment variable are used to define the install directory, then by default, it is `/usr/lib/ICAClient`.

<div style="border:1px solid black; display:inline-block; padding:4px">

NS Options

</div>

	Note: NS Options can not be combined with the **–description** parameter.
-server *<name>*	specifies the ICA application server to connect to. The name can be a fully qualified network host name, an abbreviated network host name or a dotted decimal network address.
	Either **–description** or **–server** or **– <application>** must be specified. If neither of these parameters are specified then the user will be prompted for a server name.
	–server and **–browser** are mutually exclusive.
-browser *<namelist>*	specifies the name of a master browser. The master browser is an ICA server that tells the ICA client which ICA application server to connect to and which application to run on that server.

A colon "**:**" separated list of master browsers can be specified. Each name can be a fully qualified network host name, an abbreviated network host name or a dotted decimal network address.

If neither **-server** nor **-browser** is specified and **-- <application>** is specified then the ICA Client will broadcast (typically to the local subnet) to get a master browser name.

Either **-description** or **-server** or **-- <application>** must be specified.

-server and **-browser** are mutually exclusive.

-username *<name>*   specifies the NT server login user name.

-password [<*password*>] specifies the NT server login password. The following password formats are supported:

        NSM Format: The NSM format is checked first. This is a repeating sequence of the '%' character followed by two hexadecimal characters. For example, the following is an NSM encrypted password:

                    `%B2%86%C8%78`

        ICA Format: The ICA format is checked second. This is a string of hexadecimal decimal characters. The first four characters specify the number of bytes required to contain the binary form of the remaining hexadecimal characters. For example, the following is an ICA encrypted password:

                    `0005a986568f51`

        In-the-clear: If the password is neither an NSM password nor an ICA password then it is assumed to be an unencrypted password. For example, the following is neither an NSM nor an ICA encrypted password. Hence it is an unencrypted password:

                    `mypw`

If **-password** is specified without a *<password>* then an NSM formatted password is requested from the **actlogind** daemon.

-domain *<name>*   specifies the NT server domain name.

-name *<clientname>*   specifies the client name to be used by the ICA application server. If the client name is longer than 20 characters (an ICA protocol limitation) then it is truncated to 20 characters.

If **-name** is specified but is not followed by a host name then the fully qualified host name will be obtained from the system and converted to a simple host name. A simple host name is defined to be the first name in a fully qualified dotted name string. (In other words, everything is truncated after the first decimal point.) If the

resulting string is longer than 20 bytes (an ICA protocol limitation) then it is truncated to 20 bytes.

If **–name** is not specified then the fully qualified host name is obtained from the system. If it is longer than 20 characters (an ICA protocol limitation) then the dotted decimal IP address string will be used.

–color *<number>* specifies the number of colors that the ICA application server should use to generate application graphics. Allowable values are 16 and 256.

–encryption *<level>* specifies the level of encryption to be used between the ICA client and the ICA application server. Supported encryption levels are:

basic	simple encryption (this is the default)
login	128-bit RSA encryption for login only
40	40-bit RSA encryption
56	56-bit RSA encryption (North America only)
128	128-bit RSA encryption (North America only)

If any level of encryption is specified other than **basic**, then any client side specification of username, password and/or domain, whether from the command line or from an INI file, will not be used. (The intent here is to insure the user logs into the NT server via the NT login dialog.)

–geometry *<WxH±X±Y>* the X11 window Width, Height, X offset and Y offset. All values are in pixels. Positive X offsets are from the top of the screen, negative from the bottom. Positive Y offsets are from the left side of the screen, negative from the right. Variations of this specification include *<WxH>* and *<±X±Y>*.

–geometry fullscreen same as *< max_screen_width x max_screen_height + 0 + 0 >*

–title *<text>* puts the specified text into the X11 window title bar.

–cache *<size>* size in kilobytes of the internal ICA Client transient cache.

–<keyword> <value> any unrecognized arguments will be analyzed to see if they qualify as a command line *keyword=value* pair. Any such *keyword=value* pairs are assumed to be valid .INI file entries and will be concatenated with the *keyword=value* pairs extracted from the INI files.

<keyword>=<value> pairs are not checked for validity. Hence, the ability for the ICA client to detect and report command line errors is limited.

–– <application> specifies the program that the ICA application server should run if the **–server** argument is also specified. Otherwise it specifies a published application and a master browser will be contacted to get both the program to run and the ICA application server to run it on. This parameter must be last.

Either **–description** or **–server** or **–– <application>** must be specified. If neither of these parameters are specified then the user will be prompted for a server name.

If **–– <application>** is not specified then a default description must exist in an accessible connection file.

<u>Deprecated Command Line Arguments</u>

The following V1R3 command line arguments have been deprecated. They can still be used in the V1R3-to-V2R1 migration strategy but they should not be published.

–host <*name*>   same as **–server <name>** if **–lb** is not specified. If **–lb** is specified then it is the same as **–browser <name>**

–lb   governs how the **–host** parameter will work.

–restart   ignored.

<u>FLASH Boot Support</u>

When booting the IBM Network Station from a flash card, several Boot Monitor fields may be available. In particular, one of the three Boot Host fields can be used to specify the IP address of an ICA server or ICA master browser.

Additional unused Boot Monitor (text) fields may be also used to specify ICA command line parameters. The Boot Monitor storage for these additional ICA command line parameters is limited.

The ICA Client supports the following additional command line parameters to support flash boot:

–server1   indirectly specifies the **–server** parameter where the server <name> comes from the First Boot Host parameter in NVRAM.

–server2   indirectly specifies the **–server** parameter where the server <name> comes from the Second Boot Host parameter in NVRAM.

–server3   indirectly specifies the **–server** parameter where the server <name> comes from the Third Boot Host parameter in NVRAM.

–browser1   indirectly specifies the **–browser** parameter where the browser <namelist> comes from the First Boot Host parameter in NVRAM.

–browser2   indirectly specifies the **–browser** parameter where the browser <namelist> comes from the Second Boot Host parameter in NVRAM.

–browser3   indirectly specifies the **–browser** parameter where the browser <namelist> comes from the Third Boot Host parameter in NVRAM.

–nvram <*fieldname*>   specifies the name of a text field in nvram. The text field will be analyzed and, if the first non-blank character is a dash (**–**), then the text will be used to replace the **–nvram <*fieldname*>** specification. Some nvram field names that may be available include ***second-boot-path***, ***third-boot-path*** and ***alternate-config-file***.

For example, to specify multiple ICA browsers, the following text could be entered in the Boot Monitor's Alternate Configuration File field:

-b 9.8.7.201:9.8.7.104:server2 -- MyApplication

Then the command

wfica –nvram alternate-config-file

will actually be interpreted as

wfica –b 9.8.7.201:9.8.7.104:server2 -- MyApplication

The **–server1**, **–server2**, **–server3**, **–browser1** , **–browser2** and **–browser3** arguments are mutually exclusive.

Technical Detail

Environment variables

Available before user authentication:

NSM_KIOSK_MODE   If this environment variable is defined, then the Network Station is running in kiosk Mode. If running in kiosk mode, the ICA client will run full screen with no borders. The ICA Remote Application Manager will automatically and unconditionally go into "no update" mode.

MRIPATH   The set of language specific directory paths that applications and library packages use to look for language catalogs. ICA parses this variable into a set of directories to search for ICA application defaults and help text.

ICAROOT   specifies the ICA installation directory path. If not specified then `/usr/lib/ICAClient` is assumed.

WFCMGR_OPTS   a string of ICA Remote Application Manager command line parameters that are inserted into the ICA command line immediately after the program name

NCS_OPTS   a string of ICA Client command line parameters that are inserted into the ICA command line immediately after the program name.

Note: The ICA Remote Application Manager (**wfcmgr**) invokes the ICA Client (**wfica**) with the **–description** command line parameter. This imposes restrictions on the content of this environment variable. (See Command Line Parameters section.)

Available after user authentication:

HOME   directory path for data for this user. This is used by ICA to construct a directory path, `$HOME/.ICAClient`, in which to read or write **appsrv.ini** and **wfclient.ini** files.

ICA .ini files

The ICA .ini files contain connection and configuration information. There are four ICA .ini files:

appsrv.ini   connection records (host, userid, password, encryption, window properties, ...). These records can be created, modified and deleted by the ICA Remote Application Manager. In addition, the ICA Remote Application Manager can over ride, on a record by record basis, some, not all, of the default properties found in the **wfclient.ini** file.

wfclient.ini   default properties. (browser host list, geometry, number of colors, keyboard definition, hot key definition, comm port definition, compression options, ...). Can be modified by the ICA Remote Application Manager.

module.ini   virtual drivers, protocols and transports. Cannot be modified by the ICA
                        Remote Application Manager.

keyboard.ini   keyboard menus, references to keyboard definition files.

The .ini files are located in a system mounted (remote) read-only file systems. The base
directory path name for these .ini files comes from the full path name of the executable (**wfcmgr**
or **wfica**). This can be over ridden by the ICAROOT environment variable.

In addition, **appsrv.ini** and **wfclient.ini** files are created in the $HOME/.ICAClient directory.
(This mode of operation is triggered by the existence of an $ICAROOT/config/.server file. It
serves no other purpose.) If the HOME environment variable does not exist, then the ICA
Remote Application Manager goes into "no update" mode and will only display connection
records from the Registry.

.ini files reside in the following locations:

```
r--r--r-- $ICAROOT/config/module.ini
r--r--r-- $ICAROOT/config/wfclient.ini
r--r--r-- $ICAROOT/config/appsrv.ini
R--r--r-- $ICAROOT/keyboard/keyboard.ini
rw-r--r-- $HOME/.ICAClient/wfclient.ini
rw-r--r-- $HOME/.ICAClient/appsrv.ini
```

New user .ini files are created by the ICA Remote Application Manager when and if new
connection records are created. The ICA Remote Application Manager creates the user .ini files
by copying their counterpart files from the $ICAROOT/config directory. Connection records are
then added to the **appsrv.ini** file in the user's $HOME/.ICAClient directory

Callable Interfaces

There are no external APIs or header files.

Precedence order for ICA connection Records

The current schema for precedence of ICA connection records in the ICA Remote Application
Manager is: NSM (NC Registry) first, then user's appsrv.ini file if it exists or if it does not exist,
the system appsrv.ini file. This precedence information is important for understanding what
connection records will appear in the Remote Application Manager (wfcmgr). Since the ICA code
was designed to use the connection description as the unique field, two records cannot be added
with the same description.

A problem will occur if/when NSM has a connection record with a description that is the same as
one found in either of the appsrv.ini files. Currently the NSM connection record will take
precedence and the duplicate will not be shown to the user.

Another problem could occur since NSM doesn't guarantee unique names for each connection
record. So it is possible for 2 records to exist in NSM with the same description. In this case only
the first record encountered will be shown to the user.

NSM variables

The ICA Remote Application Manager processes ICA connection records created by NSM and stored in the Registry. Each NSM connection record is a string that contains the command line parameters used to invoke the ICA client. When the ICA Remote Application Manager processes the command line arguments, any token that matches the pattern **${XXX}** is replaced by **getenv("XXX")**.

The exception to this is **${PASSWORD}**. In this case, the ICA Client requests the current user's password from the actlogin daemon.

Kiosk Mode

If the NSM_KIOSK_MODE environment variable is set then the ICA Remote Application Manager and the ICA Client run in kiosk mode. Kiosk mode is defined to be:

- A single application running full screen without window borders.
- There is a window manager.
- There is no desktop. The application is the desktop.
- No login screen is presented when the Network Station boots up. Authentication, if required, is the responsibility of the host program to which the application connects.

Either the ICA Remote Application Manager or the ICA Client can be run in kiosk mode.

ICA Supported Keyboards

Danish	French	Italian
Dutch	French (Belgian)	Norwegian
Dutch (Belgian)	French (Canadian 1988)	Portuguese
English (UK)	French (Canadian 1992)	Portuguese (Brazilian)
English (US)	French (Swiss)	Spanish
English (US ISO)	German	Spanish (Latin America)
Finnish	German (Swiss)	Swedish

Keyboards <u>NOT</u> Supported by ICA

Bulgarian	Latvian	Serbian Latin	Arabic
Byelorussian	Lithuanian	Slovakian	Chinese (Simplified)
Catalan/Spanish	Polish 214	Slovenian	Chinese (Traditional)
Czech	Polish Programmer 457	Turkish	Hebrew
Greek	Romanian	Turkish	Japanese
Hungarian	Russian	Ukrainian	Japanese (US)
Icelandic	Russian/Cyrillic		Korean
Italian (Swiss)	Serbian/Cyrillic		Thai
			Vietnamese

FLASH Boot Support

The ICA Remote Application Manager writes new or modified connection records to `$HOME/.ICAClient/appsrv.ini` and writes modified options to `$HOME/.ICAClient/wfclient.ini`. Through clever use of setting the HOME environment variable, e.g. HOME=/tmp, a place can be found to write temporary records. What the ICA Remote Application Manager does not do is create or update connection records and/or options in memory only. It always writes updates to either of the previously mentioned two files.

Migration, Coexistence and Compatibility

This version of the IBM Network Station ICA Client is upward compatible with all previous versions of the IBM Network Station ICA Client.

ICA directories and files

ICA for the IBM Network Station consists of two packages - the base package and an optional 128-bit encryption package.

Base package

The base package contains the following directories and files:

```
$ICAROOT/
    README                  - current information for ICA component
    config/appsrv.ini       - connection file template
    config/wfclient.ini     - configuration file template
    config/module.ini       - protocol file
    config/Wfcmgr           - backup wfcmgr prompts, messages, defaults
    config/Wfica            - backup wfica prompts, messages, defaults
    keyboard/keyboard.ini   - keyboard selection menu configuration
    keyboard/*.kbd          - keyboard definitions
    wfcmgr-export           - ICA Remote Application Manager (40-bit)
    wfica-export            - ICA Client (40-bit)
    wfcmgr                  - symbolic link to wfcmgr-export
    wfica                   - symbolic link to wfica-export

$MRIPATH/
    ICAClient/Wfcmgr        - ICA Remote Application Mgr app-defaults
    ICAClient/Wfica         - ICA Client app-defaults
    ICAClient/help/*.gif    - dialog image files
    ICAClient/help/*.htm    - html text files
```

128-bit encryption option package

The 128-bit package contains the following additional directories and files:

```
$ICAROOT/
    wfcmgr-us               - ICA Remote Application Manager (128-bit)
    wfica-us                - ICA Client (128-bit)
    wfcmgr                  - symbolic link to wfcmgr-us
    wfica                   - symbolic link to wfica-us
```

Note: If using a copy instead of a symbolic link, make sure **wfcmgr** and **wfica** are executable.

Low Bandwidth Considerations

Tcp buffering

If your network topology involves any low bandwidth segments and you are noticing slow performance due to the large number of ica packets being sent ver the wire, you can configure the ica connection to use a low bandwidth optimization algorithm for small packet transmissions. This will decrease the overall number of packets sent on the wire, which in some low bandwidth situations may improve the overall peformance. This should not be used in high bandwidth environments since it can actually slow down the user interface performance.

To enable the low bandwidth optimization algorithm, add the following option to the extra options section of your connection in NSM or add it to your command line parameters if you are creating your own ICA Client commands:

–TcpNoDelay No

The default is **–TcpNoDelay Yes**.

Audio quality levels

(tbd)

Persistent caching

(tbd)

Compression

(tbd)

Restrictions and Limitations

Window Managers Usurp Key Strokes

Window managers usurp key stroke combinations for their own use. This can cause functional interference when running the ICA Client as shown in the following table.

Key Sequence	NWS Window Manager	NT Window Manager
Alt		Activate NT program menu bar
Alt + <alpha>		NT application menu bar shortcuts
Alt + F4	Close current X11 window	Close current NT window
Alt + F10	Pop up X11 root menu	Delete NT (doskey) macro definitions
Alt + Space	Pop up X11 window menu	Display NT program's System menu
Alt + Esc		Cycle through NT programs
Alt + Enter		Toggle NT window <-->full screen
Alt + Minus	Same as Alt + Space	
Alt + Tab	Switch X11 windows forward	Switch NT windows forward
Alt + Shift + Tab	Switch X11 windows backwards	Switch NT windows backwards
Alt + Shift + Ctrl + F11	Toggle key sequence processing	
Ctrl + X		Cut selection
Ctrl + C		Copy selection
Ctrl + V		Paste selection
Ctrl + Z		Undo
Ctrl + Esc		Display NT Start menu
Ctrl + Shift + Esc		Display NT Task Manager
Ctrl + Alt + V	Show X11 desktop version	
Ctrl + Alt + L	Show logged-in X11 user	
Ctrl + Alt + I	Shoe X11 IP address info	
Ctrl + Alt + Backspace	Logout of X11 server	
Ctrl + Alt + Delete	Hit twice to kill X11 active window	Display NT Security menu
Print Screen	Capture X11 screen image	Capture NT screen image
Alt + Print Screen	Capture X11 active window image	Capture NT active window image

There are three workarounds to this problem:

1. Redefine the conflicting NWS Window Manager key sequences in the NWS Registry. Users familiar with the X11 window managers may have to relearn some key sequences.

2. Use the ICA Remote Application Manager's HotKey dialog to define a set of alternative key sequences that map into conflicting NT Window Manager key sequences. The ICA Client would do the actual run-time mapping. Users familiar with the NT window manager would have to relearn some key sequences. (Most Citrix ICA Clients supports this method, in part because the Windows 95/98/NT window manager cannot be changed.)

3. Use the Alt-Shift-Ctrl-F11 toggling key sequence which tells the NWS Window Manager to stop/start processing key sequences. User must remember the toggle state as there is no visual state indicator.

Caveat: Since this is a user interface issue, there probably are as many solutions as there are people who study the problem.

Caveat: No matter what key sequence one assigns to the Window Manager, some where there is a Windows program that expects to receive it.

Multiple Hosts

The ICA Client and the ICA Remote Application Manager support two types of host specification; one for direct ICA application server connection and one for communicating with an ICA master browser in load balancing situations.

The ICA Client and the ICA Remote Application Manager only support multiple hosts to specify a list of ICA master browsers. Multiple hosts to support a list of ICA application servers is not supported.

ICA protocol limitations

The ICA protocol sets restrictions that can not be circumvented by any ICA Client. This includes not only the IBM Network Station ICA Client but those for Windows 95/98/NT as well. Some of these restrictions include:

Number of Colors	The ICA protocol supports 16 and 256 color Windows applications. It does not support Windows applications that use true color.
	When the IBM Network Station is configured in true color mode, the ICA Client maps the 16 or 256 color sent through the ICA protocol to equivalent true colors on the Network Station.
Screen Resolution	The maximum screen size in the ICA protocol is 1280 pixel wide by 1024 pixels high. Increasing either dimension causes the ICA server to disconnect. The ICA Client will automatically adjust the screen resolution if it is out of bounds.
Virtual Comm Support	The ICA protocol only supports four virtual serial ports.
Virtual Parallel Support	The ICA protocol does not support virtual parallel ports.
Virtual Printer Support	The ICA protocol does not support bi-directional data communication for the parallel port. Do not configure virtual printers for bi-direction. Only locally attached printers are supported.

TAPI support

COM port mapping is not TAPI-compatable. TAPI devices cannot be mapped to client COM ports.

DOS full screen

When run as an ICA Client, the Windows 95/98/NT DOS Command Prompt window cannot be made full screen by pressing the <Alt><Enter> key sequence nor by selecting full screen in the DOS Command Prompt properties. (This only works for DOS and Windows 95/98/NT ICA Clients because they literally go into DOS mode; something the Unix based ICA Clients are unable to do.)

NT configuration problems

A good test of the Windows NT Terminal Server configuration is to (1) set the NT locale, (2) specify and attach an applicable keyboard and (3) run both NotePad and WordPad (directly from the NT). This usually identifies any problems that must be corrected before an ICA client will work correctly.

NT server print spooler crash

Citrix "hot fix" ME100002.exe (available from http://www.citrix.com/support/ftp_meta.htm) is required to fix a Citrix MetaFrame 1.7 server problem with print spooler crashes.

Lotus WordPro problems

The Lotus WordPro default font is "Times New Roman". For Turkish, select "Times New Roman (Turkish)". For Hungarian or Czechoslovakian, select "Times New Roman (Central European)".

NT keyboard layout mapping problems

The following keyboard mapping problems where found when the keyboard was directly connected to the Windows NT Terminal Server console. These NT server keyboard mapping problems are not ICA related.

Keyboard	NT Problem
Belgian Dutch	The key with base character is "superior 2", and shift character is "superior 3". With "shift lock" on, it should print "superior 3", and it prints "superior 2" instead.
Belgian French	Character Aring prints "ring" followed by "A" as 2 separate characters instead of being printed as 1 composed character.
	The key with base character is "<", and shift character is ">", with "shift lock" on, it should print ">", and it prints "<" instead.
	The key with base character is "superior 2", and shift character is "superior 3". With "shift lock" on, it should print "superior 3", and it prints "superior 2" instead.

	Characters are showing when they are not defined on the physical keyboard.
	  - The alt_gr "4" prints "{" when there is no character defined on the keyboard.
	  - The alt_gr "5" prints "}" when there is no character defined on the keyboard.

Czech	The key to the left of "Y" has three characters on it. The base character is a "&" but when selected it prints as a "\".
	The shift "+" key is suppose to be a "*" but it is "|".
	The alt_gr "+" key is suppose to be "<" but nothing prints.
	The alt_gr "y" is supposed to be a ">" but nothing prints.
Danish	Characters show when they are not defined on the physical keyboard. - The alt_gr "m" prints mu when there is no character defined on the keyboard.
French	The key with base character is "<", and shift character is ">", with "shift lock" on, it should print ">", and it prints "<" instead.
German	Character Aring prints "ring" followed by "A" as 2 separate characters instead of being printed as 1 composed character.

Hungarian	Characters are showing when they are not defined on the physical keyboard.
	  - The alt_gr "e" prints Adiaeries when there is no character defined on the keyboard.
	  - The alt_gr "i" prints Iacute when there is no character defined on the keyboard.

Polish 214	The "[" and "]" on the alt_gr position are not printing.
Russian Cyrillic	All characters on the alt_gr position of the number keys on the first row are not printing.
	The key with character "|" prints as "/".

Swiss French	Characters are showing when they are not defined on the physical keyboard.
	  - The alt_gr "4" prints degree when there is no character defined on the keyboard.
	  - The alt_gr "5" prints section when there is no character defined on the keyboard.

Turkish F	Characters are showing when they are not defined on the physical keyboard.
	  - The alt_gr "-" prints "|" when there is no character defined on the keyboard.
	  - The alt_gr "u" prints "ae" when there is no character defined on the keyboard.
	  - The alt_gr "v" prints cents when there is no character defined on the keyboard.

Turkish Q	Characters are showing when they are not defined on the physical keyboard.
	  - The alt_gr "" prints "<" when there is no character defined on the keyboard.
	  - The alt_gr "1" prints ">" when there is no character defined on the keyboard.
	  - The alt_gr "2" prints pound when there is no character defined on the keyboard.
	  - The alt_gr "5" prints "1/2" when there is no character defined on the keyboard.
	  - The alt_gr "-" prints "|" when there is no character defined on the keyboard.

Keyboard	NT Problem
	- The alt_gr "s" prints beta when there is no character defined on the keyboard.

Trouble shooting

Common problems

This section gives solutions to the most commonly-encountered problems when using the ICA Client.

I cannot connect to a Citrix server using its full Internet name.

> The server name may not be able to be resolved to an IP address if you do not have a DNS (Domain Name Server) configured on your network and on your workstation.

> Alternatively, you can specify the server by its IP address, rather than by its name.

Error messages

The option "..." is not valid.

> Missing argument for option "...".

The option "..." has an invalid argument: "...".

> The configuration file has been edited directly, or is corrupt.

Error in configuration file: "..." Cannot find section "...".

> The configuration file has been edited directly, or is corrupt.

Error in configuration file. Section "..." must contain an entry "...".

> The configuration file has been edited directly, or is corrupt.

Invalid ICA Protocol data received.

> This probably indicates a network error.

Cannot open visual: ...

> The visual (ID = ...) cannot support the required number of colors.

Cannot allocate sufficient colors. Continuing in 16 color mode.

> A suitable visual has been found but it can only support 16 colors.

Cannot find a suitable visual on this display.

> Unable to allocate a private colormap on this display.

An error occurred in the graphics system.

> There is a problem with the display. Try killing other applications such as Netscape Navigator to release the colors on your display.

Cannot find keyboard mapping file "...".

The keyboard mapping file specified in the **Preferences** page of the **Settings** dialog box is invalid or cannot be located.

A server must be entered.

A server name must be entered in the **Network** page of the **Properties** dialog box.

Window size must be between 300 and 2048.

The Custom **Width** and **Height** fields in the **Window** page of the **Properties** dialog box can take values between 300 and 2048.

Data has been changed. Are you sure you want to quit?

You are quitting from the ICA Client without saving changes to the current connection entry.

Cannot write file: "..."

There was a problem saving the connection database; for example, no disk space.

Cannot create file: "..."

There was a problem creating a new connection database.

Invalid Error: Cannot start Wfica with this connection.

The connection entry is invalid.

Cannot find selected connection.

The configuration file is corrupt. Create a new configuration file.

Cannot find specified connection.

The configuration file is corrupt. Create a new configuration file.

Error in configuration file: "..." Missing section: "..."

The configuration file is corrupt. Create a new configuration file.

Inconsistency in configuration file: "..." Missing section: "..."

The configuration file is corrupt. Create a new configuration file.

This description is already in use. The Description must be unique.

The **Description** field in the **Network** page of the **Properties** dialog box must be unique.

Cannot get address for server "..."

The server name cannot be resolved.

Unable to perform update: not running as super user.

You must be running as super user to perform a client update.

Unable to perform update: client is not on local file system.

The client cannot update an installation on a non-local (e.g. NFS mounted) file system.

Unable to perform update: not running $ICAROOT/wfica.

The client cannot update an installation other than its own.