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FTP

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FTP

Contents

FTP

You can set up your iSeries^{TM} server to send, receive, and share files across networks by using the file transfer protocol (FTP). You can also rename, add, and delete files. Before you set up your system to transfer files, you must have TCP/IP configured and started on your system.

For more information about using FTP on your iSeries server, see the following:

» What’s new for V5R2
See what functions are new to the iSeries for FTP in V5R2.

Print this topic
Download or print the FTP documentation in a PDF format.

FTP scenarios
Read scenarios to understand how FTP is configured and used.

Configure your FTP server
Set up an iSeries FTP server for graphical FTP clients, web browsers, and web tools. Configure Anonymous FTP.

Secure FTP
Protect your data by securing FTP with SSL, monitoring FTP users, and managing user access to FTP functions.

Manage your FTP server
Administer your FTP server, including starting and stopping the server, FTP security, and using SSL.

Use the FTP client on iSeries
Start and end client sessions, transfer and receive files, and set up FTP batch jobs.

FTP reference information
Find information about server and client subcommands, FTP exit programs, data transfer methods, and more.

Troubleshoot FTP
Get information on troubleshooting problems with the FTP server or FTP client.

Note: Read the Code example disclaimer for important legal information.

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What’s new for V5R2

iSeries FTP includes the following enhancements for Version 5 Release 2:

Function enhancements

- FTP server now supports libraries which reside on independent auxiliary storage pools (IASPs).
- Transport Layer Security (TLS)/Secure Sockets Layer (SSL) support
  V5R2 FTP provides the ability to use TLS/SSL from the OS/400^{R} FTP client (with server authentication

only). This support allows you to specify whether data flowing on the FTP control connection, including the password used for authentication, is encrypted. The following changes have been made to support this new capability:

  New client subcommands:
  - SECOpen (Setting data security protection)
  - SECData (Setting data security protection)

  New parameters for STRTCPFTP:
  - Secure connection (SECCNN) (See 25)
  - Data protection (DTAPROT) (See 26)

  New parameters for the LOCSITE (See 66) subcommand:
  - DTAPROT C
  - DTAPROT P
  - DTAPROT

New information
The V5R2 Information Center FTP topic has been updated. In some cases, the organization of the information has changed to provide a clearer path through the topic. The following information was added to FTP for V5R2:

- FTP scenarios provide examples to introduce basic usage concepts. You may want to refer to the scenarios as you plan and configure your FTP server on for your iSeries.
- Instructions for using SSL to secure the FTP server have been moved to this topic from the SSL topic.
- Example exit point programs for configuring Anonymous FTP have been moved to this topic from the Technical Reference site:
  - Server logon exit point contains FTP Server Logon exit program examples in CL, C, and ILE RPG code.
  - Request validation exit point contains FTP server and client Request Validation exit program examples in CL and ILE RPG code.
- Reference information that was previously available in the Configuration and Reference book has been added to the FTP topic.

How to see what's new or changed
To help you see where technical changes have been made, this information uses:

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

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

Print this topic

To view or download the PDF version, select FTP (about 600 KB or 154 pages).

Saving PDF files
To save a PDF on your workstation for viewing or printing:

1. Right-click the PDF in your browser (right-click the link above).
2. Click **Save Target As...**
3. Navigate to the directory in which you would like to save the PDF.
4. Click **Save**.

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If you need Adobe Acrobat Reader to view or print these PDFs, you can download a copy from the Adobe Web site(www.adobe.com/products/acrobat/readstep.html) .

FTP scenarios

» The following scenarios help you understand how FTP works, and how you can use an FTP environment in your network. These scenarios introduce fundamental FTP concepts from which beginners and experienced users can benefit before they proceed to the planning and configuration tasks.

Transfer a file from a remote host
You want to transfer a file to a test server. Use basic FTP to send the file to the remote host.

Secure FTP with SSL
You want to use Secure Sockets Layer (SSL) to secure data being transferred to your partner company.

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Scenario: Transfer a file from a remote host

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Objectives

Suppose a colleague did some Java^{TM} development work on a remote server. As a system test engineer, you need to transfer the example.jar file from the remote server to your local test server. Use basic FTP to transfer the file (in binary mode) across a TCP/IP network. The client and the server are both an iSeries using OS/400 FTP.

Details

To transfer the file, two connections are used: the *control connection* and the *data connection*. The control connection is used to send subcommands from the client to the server and receive responses to those subcommands from the server to the client. The client will initiate FTP subcommands that are sent to the FTP server. The data connection is used to transfer the actual files. Both the client and the server interface to the OS/400 file system. To transfer files, you will typically need a user ID on both systems. See the other requirements listed below:

- iSeries server running OS/400.
- TCP/IP Connectivity Utilities (5722-TC1)
- FTP server configured
- Host name of the remote system
- Your user name and password on the remote system
- Name of file to transfer
- Location of the file to transfer
- File format (format that you must transfer the file in, such as binary or ASCII)

Configuration tasks

You must complete each of these tasks to perform a simple file transfer:

1. Start your FTP client session.
   For this scenario: In the iSeries character-based interface, type `STRTCPFTP` and press **Enter**.
2. Specify the name of the remote system to which you want to send the file.
   For this scenario: `theirco.com`
3. Tell the remote system your user name for the remote server.
   For this scenario:
   ```
   Enter login ID (yourid):
   ===>yourid
   ```
4. Tell the remote system your password for the remote server.
   For this scenario:
   ```
   Enter password:
   ===>yourpassword
   ```
5. Locate the directory on the TheirCo server from which you want to transfer the file.
   For this scenario: `===>cd /qibm/userdata/os400/dirserv/usrtools/windows`
6. Navigate to the directory on the local server to which you want to transfer the file.
   For this scenario: `===>lcd /qibm/userdata/os400/dirserv/usrtools/windows`
7. Specify file type, ASCII or BINARY. Default file type is ASCII.
   For a .jar file, you must switch the file transfer type to binary.
   For this scenario: `===> binary`
8. Request a file transfer from the remote server system to the client system.
   For this scenario: `===> get example.jar`
9. When finished, Exit from FTP.
   For this scenario: `===> QUIT`

Next Step

Go one step further. You can also transfer files in an automated manner using Batch FTP.

Scenario: Secure FTP with SSL

Suppose you work for MyCo, a company that researches startup companies and sells the research to companies in the investment planning industry. One such company, TheirCo, has need of the service that MyCo provides, and would like to receive research reports via FTP. MyCo has always ensured the privacy and security of the data it disperses to its customers—whatever the format. In this case, MyCo needs SSL-secured FTP sessions with TheirCo.

Objectives

Your objectives in this scenario are the following:

- Create and operate a Local Certificate Authority on the MyCo iSeries server
- Enable SSL for MyCo's FTP server
- Export a copy of MyCo's Local CA certificate to a file
- Create a *SYSTEM certificate store on TheirCo's server
- Import MyCo's Local CA certificate into TheirCo's *SYSTEM certificate store
- Specify MyCo's Local CA as a trusted CA for TheirCo's FTP client

Prerequisites

MyCo

- Has an iSeries server that is running V5R1 or later of OS/400.
- Has the V5R1 or later TCP/IP Connectivity Utilities (5722-TC1) installed on the iSeries server.

- Has the Cryptographic Access Provider 128-bit for iSeries server (5722-AC3) installed on their iSeries server.
- Has the IBM^{R} Digital Certificate Manager (DCM) (5722-SS1 option 34) installed on the iSeries server.
- Has the IBM HTTP Server (5722-DG1) installed on the iSeries server.
- Uses certificates to protect access to public applications and resources (see Scenario: Use certificates to protect access to public applications and resources for detailed instructions).

TheirCo

- Has an iSeries server that is running V5R2 or later of OS/400.
- Has the V5R2 TCP/IP Connectivity Utilities (5722-TC1) installed on the iSeries server.
- Has the Cryptographic Access Provider 128-bit for iSeries server (5722-AC3) installed on their iSeries server.
- Has the IBM Digital Certificate Manager (5722-SS1 option 34) installed on the iSeries server.
- Has the IBM HTTP Server (5722-DG1) installed on the iSeries server.
- Uses OS/400 TCP/IP FTP Client for FTP sessions.

Details

TheirCo uses the OS/400 FTP Client to request a secure FTP file transfer from MyCo's FTP server. Refer to Secure the FTP client with TLS/SSL.
Server authentication takes place.
TheirCo receives financial reports from MyCo, using an SSL-secured FTP session.

Configuration tasks

The following tasks are completed by MyCo and TheirCo to secure their FTP sessions with SSL:

MyCo's tasks:

1. Create and operate a Local Certificate Authority on the MyCo iSeries server (See 5)
2. Enable SSL for MyCo's FTP server (See 6)
3. Export a copy of MyCo's Local CA certificate to a file (See 7)

TheirCo's tasks:

1. Create a *SYSTEM certificate store on TheirCo's server (See 7)
2. Import MyCo's Local CA certificate into TheirCo's *SYSTEM certificate store (See 8)
3. Specify MyCo's Local CA as a trusted CA for TheirCo's FTP client (See 8)

«

Configuration details

Complete the following task steps to Secure FTP with SSL.

Step 1: Create and operate a Local Certificate Authority (CA) on the MyCo iSeries server

This scenario assumes that MyCo has not used Digital Certificate Manager (DCM) previously to set up certificates for its iSeries server. Based on the objectives for this scenario, MyCo has chosen to create and operate a Local Certificate Authority (CA) to issue a certificate to the FTP server. However, MyCo could use DCM to configure the FTP server to use a public certificate for SSL instead.

When using Digital Certificate Manager (DCM) to create a Local CA, you are guided through a process that ensures you configure everything needed to enable SSL.

MyCo uses the following steps to create and operate a Local CA on their server, using the Digital Certificate Manager (DCM):

1. Start DCM.
2. In the navigation frame of DCM, select **Create a Certificate Authority (CA)** to display a series of forms. These forms guide you through the process of creating a Local CA and completing other tasks needed to begin using digital certificates for SSL, object signing, and signature verification.
3. Complete all the forms that display. There is a form for each of the tasks required to create and operate a Local CA on the iSeries server. These tasks include the following:
   a. Choose how to store the private key for the Local CA certificate. This step is included only if you have an IBM 4758-023 PCI Cryptographic Coprocessor installed on your iSeries. If your system does not have a cryptographic coprocessor, DCM automatically stores the certificate and its private key in the Local CA certificate store.
   b. Provide identifying information for the Local CA.
   c. Install the Local CA certificate on your PC or in your browser. This enables software to recognize the Local CA and validate certificates that the CA issues.
   d. Choose the policy data for your Local CA.
   e. Use the new Local CA to issue a server or client certificate that applications can use for SSL connections. If you have an IBM 4758-023 PCI Cryptographic Coprocessor installed in the iSeries server, this step allows you to select how to store the private key for the server or client certificate. If your system does not have a coprocessor, DCM automatically places the certificate and its private key in the *SYSTEM certificate store. DCM creates the *SYSTEM certificate store as part of this task.
   f. Select the applications that can use the server or client certificate for SSL connections. Note: Be sure to select the application ID for the OS/400 TCP/IP FTP server (QIBM_QTMF_FTP_SERVER).
   g. Use the new Local CA to issue an object signing certificate that applications can use to digitally sign objects. This creates the *OBJECTSIGNING certificate store, which you use to manage object signing certificates. Note: Although this scenario does not use object signing certificates, be sure to complete this step. If you cancel at this point in the task, the task ends and you have to perform separate tasks to complete your SSL certificate configuration.
   h. Select the applications that you want to trust the Local CA. Note: Be sure to select the application ID for the OS/400 TCP/IP FTP server (QIBM_QTMF_FTP_SERVER).

Once the forms for this guided task are completed, you can configure the FTP server to use SSL.

Step 2: Enable SSL for MyCo's FTP server

Now that the FTP server has a certificate assigned to it, MyCo configures the FTP server to use SSL by following these steps:

1. In iSeries Navigator, expand **the iSeries server** —> **Network** —> **Servers** —> **TCP/IP**.
2. Right-click **FTP**.
3. Select **Properties**.
4. Select the **General** tab.
5. Choose the following option for SSL support: **Secure only**
   Select this to allow only SSL sessions with the FTP server. Connections may be made to the non-secure FTP port, but the FTP client must negotiate an SSL session before the user is allowed to log in.

With this task complete, MyCo's FTP server can now use SSL to encrypt communication sessions and protect the privacy of the data transmitted during these sessions. However, to configure the FTP client to participate in an SSL session with the FTP server, MyCo must provide their client, TheirCo, with a copy of the Local CA certificate. To do this, MyCo needs to export a copy of the Local CA certificate to a file and make the file available to TheirCo. Once TheirCo has this file, they can use DCM to import the Local CA certificate into the *SYSTEM certificate store, and configure the OS/400 FTP client to use SSL.

Step 3: Export a copy of MyCo's Local CA certificate to a file

MyCo must provide TheirCo with a copy of the Local CA certificate. TheirCo's client application must be configured to trust the CA certificate before it can participate in an SSL session.

MyCo uses the following steps to export a copy of the Local CA certificate to a file:

1. Start DCM.
2. Click **Select a Certificate Store**.
3. Select ***SYSTEM** as the certificate store to open and click **Continue**.
4. When the Certificate Store and Password page displays, provide the password that was specified for the certificate store when it was created, and click **Continue**.
5. After the navigation frame refreshes, select **Manage Certificates**, and then select the **Export certificate** task.
6. Select **Certificate Authority (CA)** and click **Continue** to display a list of CA certificates.
7. Select the MyCo Local CA certificate from the list and click **Export**.
8. Specify **File** as the export destination and click **Continue**.
9. Specify a fully qualified path and file name for the exported Local CA certificate and click **Continue** to export the certificate.
10. Click **OK** to exit the Export confirmation page.

Now you can transfer these files to the iSeries endpoint systems on which you intend to verify signatures that you created with the certificate. You can use e-mail or FTP to transfer the files since do not need to be sent securely.

Next, TheirCo uses DCM to import the Local CA certificate into the *SYSTEM certificate store and specify the MyCo Local CA (and the certificates that it issues) as trusted.

Step 4: Create a *SYSTEM certificate store on TheirCo's server

To participate in an SSL session, TheirCo's OS/400 FTP client must be able to recognize and accept the certificate that MyCo's FTP server presents to establish the SSL session. To authenticate the server's certificate, TheirCo's FTP client must have a copy of the Certificate Authority (CA) certificate in the *SYSTEM certificate store. The *SYSTEM certificate store contains a copy of most public well-known CA certificates. However, when MyCo's FTP server uses a certificate from a Local CA, the TheirCo's FTP client must obtain a copy of the Local CA certificate and import it into the *SYSTEM certificate store.

This scenario assumes that Digital Certificate Manager (DCM) has not been previously used to create or manage certificates. Consequently, TheirCo must first create the *SYSTEM certificate store by following these steps:

1. StartDCM.
2. In the Digital Certificate Manager (DCM) navigation frame, select **Create New Certificate Store** and select ***SYSTEM** as the certificate store to create and click **Continue**.
3. Select **No** to create a certificate as part of creating the *SYSTEM certificate store and click **Continue**.
4. Specify a password for the new certificate store and click **Continue** to display a confirmation page.
5. Click **OK**.

Now TheirCo can import the Local CA certificate into the certificate store and specify it as a trusted source of certificates.

Step 5: Import MyCo’s Local CA certificate into TheirCo’s *SYSTEM certificate store

TheirCo uses these steps to import the Local CA certificate into the *SYSTEM certificate store and specify that it is a trusted source for certificates:

1. In the DCM navigation frame, click **Select a Certificate Store** and select ***SYSTEM** as the certificate store to open.
2. When the Certificate Store and Password page displays, provide the password that was specified for the certificate store when it was created, and click **Continue**.
3. After the navigation frame refreshes, select **Manage Certificates** to display a list of tasks.
4. From the task list, select **Import certificate**.
5. Select **Certificate Authority (CA)** as the certificate type and click **Continue**.
6. Specify the fully qualified path and file name for the CA certificate file and click **Continue**. A message displays that either confirms that the import process succeeded or provide error information if the process failed.

Now you TheirCO can specify that their FTP client trusts MyCo’s Local CA certificate, so that the TheirCo’s FTP client can participate in SSL sessions with server applications that use a certificate from MyCo’s Local CA.

Step 6: Specify MyCo’s Local CA as a trusted CA for TheirCo’s FTP client

Before TheirCo can use the FTP client to make secure connections to the MyCo FTP server, TheirCo must use DCM to specify which CAs the client should trust. This means that TheirCo must specify that the Local CA certificate that was imported previously is to be trusted.

TheirCo uses the following steps to specify that their FTP client should trust MyCo’s Local CA certificate:

1. Start DCM.
2. Click **Select a Certificate Store** and select *SYSTEM as the certificate store to open.
3. When the Certificate Store and Password page displays, provide the password that was specified for the certificate store when it was created, and click **Continue**.
4. In the navigation frame, select **Manage Applications** to display a list of tasks.
5. From the task list, select **Define CA trust list**.
6. Select **Client** as the type of application for which you want to define the list and click **Continue**.
7. Select the OS/400 TCP/IP FTP Client application (QIBM_QTMF_FTP_CLIENT) from the list and click **Continue** to display a list of CA certificates.
8. Select MyCo’s Local CA certificate that was imported previously and click **OK**. DCM displays a message to confirm the trust list selection.

With these steps complete, MyCo’s FTP server can establish an SSL session with TheirCo’s FTP client and server. Refer to Secure the FTP client with TLS/SSL.

Configure your FTP server

» The TCP/IP Connectivity Utilities licensed program comes with TCP/IP FTP servers configured. When you start TCP/IP, the FTP server starts simultaneously.

Before you configure an FTP server on the Internet, you should review these safeguards to protect your data:

- Use a firewall between your iSeries server and the Internet.
- Use a non-production iSeries for your FTP server.

- Do not attach the FTP server to the rest of your company's LANs or WANs.
- Use FTP exit programs to secure access to the FTP server.
- Test FTP exit programs once a month to ensure that they do not contain security loopholes.
- Do not allow anonymous FTP users to have read and write access to the same directory. This permits the anonymous user to be untraceable on the Internet.
- Log all access to your iSeries FTP server and review the logs daily or weekly for possible attacks.
- Verify that the correct exit programs are registered for the FTP server once a month.
- Review Secure FTP for information about securing your iSeries FTP server.

The following topics offer ways to view and customize your FTP servers:

FTP server in iSeries Navigator
Use iSeries Navigator to configure and manage your iSeries FTP server.

Configure FTP servers for graphical FTP clients and Web tools
Configure an FTP server on your iSeries to support graphical FTP clients, Web browsers, and other Web tools.

Configure Anonymous FTP
Anonymous FTP enables remote users to use your FTP server without an assigned userid and password.

FTP server in iSeries Navigator

You can use iSeries Navigator to work with your FTP server configuration. To access the graphical user interface for FTP in iSeries Navigator, follow these steps:

1. In iSeries Navigator, expand **your iSeries server** —> **Network** —> **Servers** —> **TCP/IP**.
2. In the right pane, right-click **FTP** and select **Properties**.
3. From here, you can change the properties for your FTP server. You can view the online help by clicking the help buttons. To obtain help for a specific field, click the question mark button, then click that field.

Configure FTP servers for graphical FTP clients and Web tools

The iSeries FTP server supports graphical FTP clients, Web browsers, and Web development tools.

Most graphical FTP clients use UNIX[R] as their list format and path file as their file name format. Follow these instructions to set the FTP server properties to use the supported formats:

1. In iSeries Navigator, expand **your iSeries server** —> **Network** —> **Servers** —> **TCP/IP**.
2. In the right pane, right-click **FTP** and select **Properties**.
3. On the **Properties** page, click the **Initial Formats** tab.
   - Enable **Path** as the File Naming Format.
   - Enable **UNIX list format** as the File List Format.

Note: You can control the LISTFMT and NAMEFMT settings for specific FTP sessions using an exit program for the TCPL0200 format or TCPL0300 format of the FTP Server Logon Exit Point.

You can also change the list format *after* an FTP session is in progress with options for the FTP server SITE (Send Information Used by a Server System) subcommand. These settings control the results returned by the LIST (File List) and NLST (Name List) FTP server subcommands.

You may also want to refer to:

- LIST Information in iSeries format
- LIST information in UNIX-style format

Configure Anonymous FTP

Anonymous FTP enables unprotected access (no password required) to selected information on a remote system. The remote site determines what information is made available for general access. Such information is considered to be publicly accessible and can be read by anyone. It is the responsibility of the person who owns the information and the system to assure that only appropriate information is made available.

To access this information, a user logs on to the hosts using the user ID ANONYMOUS. The user ANONYMOUS has limited access rights to the files on the server and has some operating restrictions. Typically, the only operations allowed include the following:

- Logging on using FTP
- Listing the contents of a limited set of directories
- Retrieving files from these directories.

Usually, anonymous users are not allowed to transfer files to the FTP server system. Some systems do provide an incoming directory for anonymous uses to send data to. Traditionally, the special anonymous user account accepts a string as a password, although it is common to use either the password ’guest’ or one’s e-mail address. Some archive sites explicitly ask for the user’s e-mail address and will not allow logon with the guest password. Providing an e-mail address is a courtesy that allows the archive site operators to get some idea of who is using their services.

Anonymous FTP on the iSeries
The basic File Transfer Protocol (FTP) server does not support anonymous FTP. To set up anonymous FTP on your iSeries server, you need to provide exit programs for the two FTP Server exit points (server logon exit point and request validation exit point).

You may want to provide anonymous FTP because it is a convenient and often necessary service. However, the use of anonymous FTP raises security concerns for your iSeries server. See Securing FTP with exit programs for more information about protecting your system.

To configure Anonymous FTP, complete these tasks:

1. **Prepare for Anonymous FTP**
   Review the technical requirements and define a security policy.
2. **Write exit programs for Anonymous FTP**
   Write two exit programs for Anonymous FTP support. This topic provides many examples of exit programs as well as useful tips and techniques.
3. **Create an OS/400 User Profile ANONYMOUS**
   Prevent anyone from signing on to your iSeries server *directly* with a user ID of ANONYMOUS.
4. **Create a Public Library or Directory**
   Create, load, and set your public libraries or directories.
5. **Install and register your exit programs**
   Create a library to contain your exit programs and their log files, compile the programs, and register them for use by the FTP server.

Prepare for Anonymous FTP

Consider the following information as you prepare to configure Anonymous FTP.

Skill Requirements

To set up Anonymous FTP, you will need the following skills:

- Familiarity with the iSeries character-based interface and commands with multiple parameters and keywords.
- Ability to create libraries, members, and source physical files on your iSeries (you should have at least *SECOFR authority).
- Ability to assign authorities to libraries, files, members, and programs.
- Ability to write, change, compile, and test programs on your iSeries server.

Security considerations

Your first step in implementing Anonymous FTP is to define your Anonymous FTP server site policy. This plan defines your FTP site security and determines how to code your exit programs. Because your FTP server will be allowing anyone in the world to access your data, you must carefully consider how you want it to be used and what data must be protected.

Review the following recommendations for your FTP site policy plan:

- Use a firewall between your iSeries server and the Internet.
- Use a non-production iSeries for your FTP server.
- Do not attach the FTP server to the rest of your company's LANs or WANs.
- Use FTP exit programs to secure access to the FTP server.
- Test FTP exit programs to ensure that they do not contain security loopholes.
- Do not allow anonymous FTP users to have read and write access to the same directory. This permits the anonymous user to be untraceable on the Internet.
- Allow ANONYMOUS access only. Do not allow any other userids and do not authenticate passwords.
- Restrict ANONYMOUS access to one public library or directory only. (Where will it be? What will you call it?)
- Place only public access files in the public library or directory.
- Restrict ANONYMOUS users to 'view' and 'retrieve' subcommands only (get, mget). **Do not under any circumstances allow ANONYMOUS users to use CL commands.**
- Log all access to your iSeries FTP server.
- Review FTP server logs daily or weekly for possible attacks.
- Verify that the FTP server registers the correct exit programs once a month.
- Test the FTP server for security holes once a month.

What to do next:

Write two exit programs for Anonymous FTP support.

Write exit programs for Anonymous FTP

To support Anonymous FTP, you need to write two exit programs: FTP Server Logon exit program and FTP Server Request Validation exit program. The FTP Server Logon exit program enables the ANONYMOUS user ID and forces the ANONYMOUS user to the public library or directory. The FTP Server Request Validation exit program restricts the commands, files, and directories or libraries that the ANONYMOUS user can use.

Exit points and exit point formats

The FTP server communicates with each exit program through a specific exit point. Parameters are passed between the server and the exit program. The format of the exchanged information is specified by an exit point format. For more information about the exit point programs for FTP, refer to FTP exit programs. The following exit points are used for Anonymous FTP:

Program	Exit Point	Format
Server logon	QIBM_QTMF_SVR_LOGON	TCPL0100, TCPL0200, or TCPL0300.[1]
Request validation	QIBM_QTMF_SERVER_REQ	VLRQ0100

[1] -An exit point may have more than one format, but an exit program can only be registered for one of the exit point formats. Examine each of these formats, then choose the one most appropriate for your system.

Example programs
Example programs are available to help you set up anonymous FTP on your server. You can use these samples as a starting point to build your own programs. By copying portions of the code from the samples, you can add them to programs that you write yourself. It is recommended that you run the sample programs on a system other than your production system.

Note: These examples are for illustration purposes only. They do not contain enough features to run on a production machine as is. Feel free to use them as a starting point, or to use sections of code as you write your own programs.

To view the example programs, refer to server programs for Server logon exit point and Request validation exit point.

What to do next:

Create an OS/400 user profile: ANONYMOUS

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Create an OS/400 user profile: ANONYMOUS

To prevent anyone from directly signing on to your iSeries server with the user profile ANONYMOUS, it is strongly recommended that you create a user profile of ANONYMOUS and assign it a password of *NONE. You can create this profile using iSeries Navigator.

1. In **iSeries Navigator**, expand **Users and Groups**.
2. Right-click **All Users** and select **New Users**.
3. On the New Users panel, enter the following information:
   User name = ANONYMOUS and
   Password = No password.
4. Click the **Jobs** button and select the General tab.
5. On the General tab, assign the Current library and Home directory that the Anonymous user should use.
6. Click **OK** and complete any other settings.
7. Click **Add** to create the profile.

What to do next:

Create a Public Library or Directory

Create a public library or directory

After creating anonymous users, you may want to create a public library or directory for them to use. Usually anonymous users should only be able to access public files. It is recommended that you restrict anonymous users to a single library or a single directory tree, which only contain “public” files.

1. Create the public libraries or directories that will contain files accessible through anonymous FTP.
2. Load your public libraries or directories with the public access files.
3. Set the public libraries or directories and file authorities to PUBLIC *USE.

What to do next:

Install and register exit programs

Install and register exit programs

Install the exit program

1. Create a library to contain your exit programs and their log files.
2. Compile your exit programs in this library.
3. Grant PUBLIC *EXCLUDE authority to the library, program, and file objects.

   The FTP server application adopts authority when necessary to resolve and call the exit program.

Register the exit program

1. At the iSeries character-based interface, enter **WRKREGINF**.
2. Page down to an FTP Server Logon exit point:

   ```
   QIBM_QTMF_SVR_LOGON   TCPL0100
   QIBM_QTMF_SVR_LOGON   TCPL0200
   QIBM_QTMF_SVR_LOGON   TCPL0300
   QIBM_QTMF_SERVER_REQ  VLRQ0100
   ```

3. Enter **8** in the Opt field to the left of the exit point entry and press **Enter**.
4. At the Work with Exit Programs display, enter a **1**(add).
5. Enter the name of the exit program in the Exit Program field.
6. Enter the name of the library that contains the exit program in the Library field.
7. Press **Enter**.
8. End and restart the FTP server to ensure that all FTP server instances use the exit programs.
9. Test your exit programs thoroughly.

Note: Exit programs take effect as soon as the FTP server requests a new FTP session. Sessions that are already running are not affected.

Related topic: Removing installed exit programs

Secure FTP

If you use your iSeries system as an FTP server on the Internet, it is accessible to the entire world. Therefore, attention to FTP security is necessary to ensure that vital business data stored on your iSeries server is not compromised. There are also steps you can take to protect your FTP client.

You can find information about ways to protect the FTP server and client in the following topics:

Prevent FTP server access
If you are not using FTP, you should prevent FTP from running to ensure no one can enter your iSeries server through the FTP port. This topic explains how to block the FTP port.

Control FTP access
If you are using FTP, you need to keep control over users to protect your data and network. This topic offers tips and security considerations.

Use Secure Sockets Layer (SSL) to secure FTP
SSL support allows the user to eliminate the exposure of sending passwords and data “in the clear” on the network when using the OS/400 FTP server with an FTP client that also supports SSL.

Manage access using FTP exit programs
This topic describes how to use FTP exit points to protect your iSeries.

Manage access using iSeries Navigator
You can use Application Administration Limit Access in iSeries Navigator to protect your iSeries FTP server or client.

Monitoring incoming FTP users
Monitor who is logging in to your FTP server.

Prevent FTP server access

» If you do not want anyone to use FTP to access your iSeries server, you should prevent the FTP server from running. To prevent FTP access to your iSeries, follow these steps:

Prevent the FTP server from starting automatically

To prevent FTP server jobs from starting automatically when you start TCP/IP, follow these steps:

1. In iSeries Navigator, expand **your iSeries Server** —> **Network** —> **Servers** —> **TCP/IP**.
2. Right-click **FTP** and select **Properties**.
3. Deselect **Start when TCP/IP starts**.

Prevent access to FTP ports

To prevent FTP from starting and to prevent someone from associating a user application, such as a socket application, with the port that the iSeries normally uses for FTP, do the following:

1. In iSeries Navigator, expand **your iSeries Server** —> **Network** —> **Servers** —> **TCP/IP**.
2. Right-click **TCP/IP Configuration** and select **Properties**.
3. In the **TCP/IP Configuration Properties** window, click the **Port Restrictions** tab.
4. On the **Port Restrictions** page, click **Add**.
5. On the **Add Port Restriction** page, specify the following:
   - **User name**: Specify a user profile name that is protected on your iSeries. (A protected user profile is a user profile that does not own programs that adopt authority and does not have a password that is known by other users.) By restricting the port to a specific user, you automatically exclude all other users.
   - **Starting port**: 20
   - **Ending port**: 21
   - **Protocol**: TCP
6. Click **OK** to add the restriction.
7. On the **Port Restrictions** page, click **Add** and repeat the procedure for the UDP protocol.
8. Click **OK** to save your port restrictions and close the **TCP/IP Configuration Properties** window.
9. The port restriction takes effect the next time that you start TCP/IP. If TCP/IP is active when you set the port restrictions, you should end TCP/IP and start it again.

Notes:

- The port restriction takes effect the next time that you start TCP/IP. If TCP/IP is active when you set the port restrictions, you should end TCP/IP and start it again.
- The Internet Assigned Numbers Authority (IANA) website provides information about assigned port numbers at http://www.iana.org .
- If ports 20 or 21 are restricted to a user profile other than QTCP, attempting to start the FTP server will cause it to immediately end with errors.
- This method works only for completely restricting an application such as the FTP server. It does not work for restricting specific users. When a user connects to the FTP server, the request uses the QTCP profile initially. The system changes to the individual user profile after the connection is successful. Every user of the FTP server uses QTCP's authority to the port.

«

Control FTP access

» If you want to allow FTP clients to access your system, be aware of the following security concerns:

- Your object authority scheme might not provide detailed enough protection when you allow FTP on your system. For example, when a user has the authority to view a file (*USE authority), the user can also copy the file to a PC or to another system. You might want to protect some files from being copied to another system.
- You can use FTP exit programs to restrict the FTP operations that users can perform. You can use the FTP Request Validation Exit to control what operations you allow. For example, you can reject GET requests for specific database files.
- You can use the Server logon exit point to authenticate users who log on to the FTP server. Configure Anonymous FTP describes how to use exit programs to set up support for Anonymous FTP on your system.
- Unless you use TLS/SSL, FTP passwords are not encrypted when they are sent between the client system and the server system. Depending on your connection methods, your system may be vulnerable to password theft through line sniffing.
- If the QMAXSGNACN system value is set to 1, the QMAXSIGN system value applies to TELNET but not to FTP. If QMAXSGNACN is set to 2 or 3 (values which disable the profile if the maximum sign on count is reached), FTP logon attempts are counted. In this case, a hacker can mount a denial of service attack through FTP by repeatedly attempting to log on with an incorrect password until the user profile is disabled.
- For each unsuccessful attempt, the system writes message CPF2234 to the QHST log. You can write a program to monitor the QHST log for the message. If the program detects repeated attempts, it can end the FTP servers.
- You can use the Inactivity timeout (INACTTIMO) parameter on the FTP configuration to reduce the exposure when a user leaves an FTP session unattended. Be sure to read the documentation or online help to understand how the INACTTIMO parameter and the connection timer (for server startup) work together.

Note: The QINACTITV system value does not affect FTP sessions.

- When you use FTP batch support, the program must send both the user ID and the password to the server system. Either the user ID and password must be coded in the program, or the program must retrieve them from a file. Both these options for storing passwords and user IDs represent a potential security exposure. If you use FTP batch, you must ensure that you use object security to protect the user ID and password information. You should also use a single user ID that has limited authority on the target system. It should have only enough authority to perform the function that you want, such as file transfer.

- FTP provides remote-command capability, just as advanced program-to-program communications (APPC) and iSeries Access do. The RCMD (Remote Command) FTP-server subcommand is the equivalent of having a command line on the system. Before you allow FTP, you must ensure that your object security scheme is adequate. You can also use the FTP exit program to limit or reject attempts to use the RCMD subcommand. FTP exit programs describes this exit point and provides sample programs.
- A user can access objects in the integrated file system with FTP. Therefore, you need to ensure that your authority scheme for the integrated file system is adequate when you run the FTP server on your system.
- A popular hacker activity is to set up an unsuspecting site as a repository for information. Sometimes, the information might be illegal or pornographic. If a hacker gains access to your site through FTP, the hacker uploads this undesirable information to your iSeries. The hacker then informs other hackers of your FTP address. They in turn access your iSeries with FTP and download the undesirable information.

  You can use the FTP exit programs to help protect against this type of attack. For example, you might direct all requests to upload information to a directory that is write-only. This defeats the hacker's objective because the hacker's friends will not be able to download the information in the directory.

  AS/400^{R} Internet Security: Protecting Your AS/400 from HARM on the Internet provides more information about the risks and possible solutions when you allow uploading through FTP.

«

Use SSL to secure the FTP server

» The FTP server provides enhanced security while sending and receiving files over a untrusted network. FTP server uses Secure Sockets Layer (SSL) to secure passwords and other sensitive data during an information exchange. The FTP server supports either SSL or TLS protected sessions, including client authentication and automatic sign-on (see SSL concepts for additional information about the TLS and SSL protocols).

Most SSL-enabled applications connect a client to separate TCP ports, one port for "unprotected" sessions and the other for secure sessions. However, secure FTP is a bit more flexible. A client can connect to a non-encrypted TCP port (usually TCP port 21) and then negotiate authentication and encryption options. A client can also choose a secure FTP port (usually TCP port 990), where connections are assumed to be SSL. The iSeries FTP server provides for both of these options.

Before you can configure the FTP server to use SSL, you must have installed the prerequisite programs and set up digital certificates on your iSeries.

To configure SSL to secure FTP, complete the following tasks:

1. Create a local Certificate Authority or use DCM to configure the FTP server to use a public certificate for SSL.
2. Associate a certificate with the FTP server
3. Require client authentication for the FTP server (optional)
4. Enable SSL on the FTP server

See Secure the FTP client with TLS/SSL for related information. «

Create a local Certificate Authority

» You can use the IBM Digital Certificate Manager (DCM) to create and operate a Local Certificate Authority (CA) on your iSeries server. A Local CA enables you to issue private certificates for applications that run on your iSeries server.

To use DCM to create and operate a Local CA on the iSeries server, follow these steps:

1. Start DCM.
2. In the navigation frame of DCM, select **Create a Certificate Authority (CA)** to display a series of forms. These forms guide you through the process of creating a Local CA and completing other tasks needed to begin using digital certificates for SSL, object signing, and signature verification.
3. Complete all the forms that display. There is a form for each of the tasks that you need to perform to create and operate a Local CA on the iSeries server. Completing these forms allows you to:
   a. Choose how to store the private key for the Local CA certificate. This step is included only if you have an IBM 4758-023 PCI Cryptographic Coprocessor installed on your iSeries. If your system does not have a cryptographic coprocessor, DCM automatically stores the certificate and its private key in the Local CA certificate store.
   b. Provide identifying information for the Local CA.
   c. Install the Local CA certificate on your PC or in your browser. This enables software to recognize the Local CA and validate certificates that the CA issues.
   d. Choose the policy data for your Local CA.
   e. Use the new Local CA to issue a server or client certificate that applications can use for SSL connections. If you have an IBM 4758-023 PCI Cryptographic Coprocessor installed in the iSeries server, this step allows you to select how to store the private key for the server or client certificate. If your system does not have a coprocessor, DCM automatically places the certificate and its private key in the *SYSTEM certificate store. DCM creates the *SYSTEM certificate store as part of this task.
   f. Select the applications that can use the server or client certificate for SSL connections. Note: Be sure to select the application ID for the OS/400 FTP Server (QIBM_QTMF_FTP_SERVER).
   g. Use the new Local CA to issue an object signing certificate that applications can use to digitally sign objects. This creates the *OBJECTSIGNING certificate store, which you use to manage object signing certificates. Note: Although this scenario does not use object signing certificates, be sure to complete this step. If you cancel at this point in the task, the task ends and you have to perform separate tasks to complete your SSL certificate configuration..
   h. Select the applications that you want to trust the Local CA. Note: Be sure to select the application ID for the OS/400 FTP Server (QIBM_QTMF_FTP_SERVER).

See these related pages for more information about certificates:

Manage user certificates
Learn how your users can use DCM to obtain certificates or associate existing certificates with their iSeries user profiles.

Use APIs to programmatically issue certificates to non-iSeries users
Learn how you can use your Local CA to issue private certificates to users without associating the certificate with an iSeries user profile.

Obtain a copy of the private CA certificate
Learn how to obtain a copy of the private CA certificate and install it on your PC so that you can authenticate any server certificates that the CA issues.

What to do next:

Associate a certificate with the FTP server

«

Associate a certificate with the FTP server

» Perform this task if you did not perform the task to assign a certificate to the FTP server application during the creation of the Local Certificate Authority (CA), or if you have configured your system to request a certificate from a Public CA.

1. Start IBM Digital Certificate Manager. If you need to obtain or create certificates, or otherwise setup or change your certificate system, do so now. See Using Digital Certificate Manager for information on setting up a certificate system.
2. Click the **Select a Certificate Store** button.
3. Select ***SYSTEM**. Click **Continue**.
4. Enter the appropriate password for *SYSTEM certificate store. Click **Continue**.
5. When the left navigational menu reloads, expand **Manage Applications**.
6. Click **Update certificate assignment**.
7. On the next screen, select **Server** application. Click **Continue**.
8. Select the **OS/400 TCP/IP FTP Server**.
9. Click **Update Certificate Assignment** to assign a certificate to the OS/400 TCP/IP FTP Server.
10. Select a certificate from the list to assign to the server.
11. Click **Assign New Certificate**.
12. DCM reloads to the **Update Certificate Assignment** page with a confirmation message. When you are finished setting up the certificates for the FTP server, click **Done**.

What to do next:

Require client authentication for the FTP server (optional)
or
Enable SSL on the FTP server

«

Require client authentication for the FTP server (optional)

» If you need the FTP server to authenticate clients, you can change the application specifications in IBM Digital Certificate Manager.

Note: The FTP server supports client authentication, but the OS/400 FTP Client does not. Some users may still want to require client authentication, but it will exclude the use of the OS/400 FTP Client for SSL connections.

If an FTP client connects and client authentication is enabled for the server, the client must still send a USER subcommand. Once the USER subcommand information is sent, the FTP server will check that the user matches the profile associated with the client certificate that the client sent to the server as part of the SSL handshake. If the user matches the client certificate, no password is needed and the FTP server will log the user onto the system. The USER subcommand is needed because there is no mechanism in the FTP protocol to “inform” the client that it’s logged on without the command.

1. Start IBM Digital Certificate Manager. If you need to obtain or create certificates, or otherwise setup or change your certificate system, do so now. See Using Digital Certificate Manager for information on setting up a certificate system.
2. Click the **Select a Certificate Store** button.
3. Select ***SYSTEM**. Click **Continue**.
4. Enter the appropriate password for *SYSTEM certificate store. Click **Continue**.
5. When the left navigational menu reloads, expand **Manage Applications**.

6. Click **Update application definition**.
7. On the next screen, select **Server** application. Click **Continue**.
8. Select the **OS/400 TCP/IP FTP Server**.
9. Click **Update Application Definition**.
10. In the table that displays, select **Yes** to require client authentication.
11. Click **Apply**.
12. DCM reloads to the **Update Application Definition** page with a confirmation message. When you are finished updating the application definition for the FTP server, click **Done**.

What to do next:

Enable SSL on the FTP server

«

Enable SSL on the FTP server

» Perform the following steps to Enable SSl on the FTP server:

1. In iSeries Navigator, expand **your iSeries server** —> **Network** —> **Servers** —> **TCP/IP**.
2. Right-click **FTP**.
3. Select **Properties**.
4. Select the **General** tab.
5. Choose one of these options for SSL support:
   - **Secure only**
     Select this to allow only SSL sessions with the FTP server. Connections may be made to the non-secure FTP port, but the FTP client must negotiate an SSL session before the user is allowed to log in.
   - **Non-secure only**
     Select this to prohibit secure sessions with the FTP server. Attempts to connect to an SSL port will not connect.
   - **Both secure and non-secure**
     Allows both secure and non-secure sessions with the FTP server.

Note: You do not need to restart the FTP server. It will dynamically detect that a certificate has been assigned to it. If it does not dynamically detect this change, verify that you have the latest PTFs applied to your iSeries server.

«

Secure the FTP client with TLS/SSL

» You can use Transport Layer Security (TLS) / Secure Sockets Layer (SSL) connections to encrypt data transferred over FTP control and data connections. The primary reason for encryption on the control connection is to conceal the password when logging on to the FTP server.

Before using the FTP client to make secure connections to servers, you must use DCM to configure trusted certificate authorities for the FTP Client. Any certificate authorities which were used to create certificates assigned to servers that you want to connect to must be added. Exporting or importing Certificate Authority (CA) certificates may be required depending on the CAs used. Refer to Define a CA trust list for an application in the DCM topic for more information about CA trusted authorities.

If you choose TLS/SSL encryption for the control connection, the FTP client will also encrypt the data sent on the FTP data connection by default. FTP protocol does not allow you to have a secure data connection without a secure control connection.

Encryption can have a significant performance cost and can be bypassed on the data connection. This allows you to transfer non-sensitive files without decreasing performance and still protect the system's security by not exposing passwords.

The FTP client has parameters for the STRTCPFTP CL command and subcommands which are used as part of the TLS/SSL support (SECOpen and SECData).

Specifying TLS/SSL protection for the iSeries FTP Client

Control Connection
TLS/SSL protection can be specified on the STRTCPFTP command and the SECOPEN subcommand.

For the STRTCPFTP (FTP) command, specify *SSL for the SECCNN secure connection parameter to request a secure control connection. Also, you may be able to specify *IMPLICIT to obtain a secure connection on a pre-defined server port number. (See IMPLICIT SSL Connection below for more details.)

Within your FTP client session, the SECOPEN subcommand can be used to obtain a secure control connection.

Data Connection
For the STRTCPFTP (FTP) command, enter *PRIVATE for the DTAPROT data protection parameter to specify a secure data connection. Enter *CLEAR for the DTAPROT data protection parameter to specify data to be sent without encryption.

When you have a secure control connection, you can use the SECDATA subcommand to change the data connection protection level.

Implicit SSL connection
Some FTP servers support what is called an implicit SSL connection. This connection provides the same encryption protection as the *SSL option, but can only be done on a pre-determined server port, usually 990, for which the server must be configured to expect an SSL/TLS connection negotiation.

This method is provided to allow secure connections to those FTP implementations that may not support the standard protocol for providing TLS/SSL protection.

Many early implementations of SSL support used the implicit approach, but now it is no longer recommended and has been deprecated by the IETF.

Note: The standard protocol for setting up an TLS/SSL connection requires that the AUTH (Authorization) server subcommand be used when making the connection to the server. Also, the server subcommands PBSZ and PROT are used to specify the data protection level.

However, for an implicit SSL connection, the AUTH, PBSZ, and PROT server subcommands are **not** sent to the server. Instead, the server will act as if the client had sent these subcommands with the parameters shown below:

- AUTH SSL
- PBSZ 0
- PROT P

«

Manage access using FTP exit programs

FTP provides a security level based on the OS/400 object security. This means that remote users cannot logon to your iSeries FTP server unless they have a valid user profile and password.

You can provide additional security by adding FTP exit programs to the FTP Server and Client exit points to further restrict FTP access to your system. For example, you can restrict FTP logon capability, as well as access to libraries, objects, and the use of commands.

You can write an FTP Server Request Validation exit program to restrict the CL commands and FTP subcommands that users may access. For instructions and examples, see the Request validation exit point: client and server topic.

You can control the authentication of users to a TCP/IP application server with an exit program for the Server logon exit point.

You can write an FTP Client Request Validation exit program for the Client exit point: Request validation. This controls which FTP client functions a user may perform.

Depending on your situation, you may consider limiting access to FTP subcommands using Application Administration Limit Access as an alternative to writing exit programs for the FTP Server Request Validation and FTP Client Request Validation exit points.

To allow the exit programs to work properly, you must Install and register your exit point programs. If your programs are no longer needed, you must properly Remove the exit point programs to prevent their future functioning.

Manage access using iSeries Navigator

You can use iSeries Navigator to limit user access to FTP server and client functions. Use Application Administration to grant and deny access to functions for individual users or for groups of users. Alternatively, you can manage access to FTP functions by writing FTP exit programs for the FTP Request Validation Exit Points.

To manage user access to functions using iSeries Navigator, complete the following steps:

1. In iSeries Navigator, right-click **your iSeries server** and select **Application Administration**.
2. Select the **Host Applications** tab.
3. Expand **TCP/IP Utilities for iSeries**.

4. Expand **File Transfer Protocol (FTP)**.
5. Expand **FTP Client** or **FTP Server**.
6. Select the function that you want to allow or deny access to.
7. Click **Customize**.
8. Use the **Customize Usage** dialog to change the list of users and groups that are allowed or denied access to the function.
9. Click **OK** to save changes to the **Customize Access** page.
10. Click **OK** to exit the **Application Administration** page.

Alternatively, you can manage the access that a specific user or group has to registered FTP functions through iSeries Navigator's Users and Groups management tool. To do this, follow these steps:

1. In iSeries Navigator, expand **your iSeries server** —> **Users and Groups**.
2. Select **All Users** or **Groups**.
3. Right-click a user or group, then select **Properties**.
4. Click **Capabilities**.
5. Click **Applications**.

   From here, you can change the user or group's settings for the listed function. You can also can change the settings for all functions in a hierarchy grouping by changing the settings of the "parent" function.

For more information on securing your iSeries FTP server, see the Implementing FTP security topic.

Monitor incoming FTP users

Logging and reviewing FTP use will allow you to monitor activity and check for outside attacks. To monitor for incoming FTP users, follow these steps:

1. In iSeries Navigator, expand **your server** —> **Network** —> **Servers** —> **TCP/IP**.
2. In the right pane, right-click **FTP** and select **Server Jobs**.
3. The FTP server job panel appears. The Current user column displays the user logged in to the server job. If no user is logged in, Qtcp is displayed. Press **F5** or select **View —> Refresh** to update the display.

The format for the names of these jobs is *QTFTPnnnnn*. The *nnnnn* is a randomly-generated number.

To start FTP server jobs, follow the steps in Start the FTP server.

Manage your FTP server

You can set up your iSeries server to send, receive, and share files across networks by using file transfer protocol (FTP). FTP consists of two parts: the FTP client and the FTP server. You interact with the FTP client. The FTP client interacts with the FTP server. You do not normally interact directly with the FTP server. The following topics will help you to administer your FTP server:

- Start and stop the FTP server
- Set number of available FTP servers
- Improve FTP performance with configurable subsystem support

Start and stop the FTP server

The FTP server can be started and stopped using iSeries Navigator. For instructions on how to access FTP, see Accessing FTP through iSeries Navigator.

To start the FTP server, complete the following steps:

1. In iSeries Navigator, expand **your iSeries server** —> **Network** —> **Servers** —> **TCP/IP**.
2. In the right pane, right-click **FTP** and select **Start**.

To stop the FTP server, complete the following steps:

1. In iSeries Navigator, expand **your iSeries server** —> **Network** —> **Servers** —> **TCP/IP**.
2. In the right pane, right-click **FTP** and select **Stop**.

Set number of available FTP servers

» You can specify the minimum number of available servers to be kept ready for future client connections. To set this value, go to the **FTP Properties** page and specify a number from 1 to 20 for the **Initial number of servers to start**. Specifying a value of 1 delays incoming connections to the FTP server. The recommended value is 3.

When a client connects to an iSeries FTP server, the server examines the number of active servers that are not connected to a client and the value specified for the initial number of servers to start. If the initial server value is greater than the number of available servers, additional servers are started so that the two numbers are equal. If the initial server value is less than the number of available servers, no action is taken. Changes to the initial server value take effect at the time of the next client connection, when the above process is activated.

For example, if there are five FTP client sessions established at the same time and the initial server value is set at 10, there will be 15 FTP servers running. The 15 servers include five servers for the five active client sessions and ten available servers. The number of available servers can be larger than the initial server value. In this same example, if the five clients end their sessions and no other sessions are started, there will be 15 available servers. «

Improve FTP server performance with configurable subsystem support

The default subsystem (QSYS/QSYSWRK) is used for many IBM-supplied server jobs. Using a different subsystem than the default subsystem can result in improved FTP performance because the need to share resources is eliminated.

To configure a subsystem for the FTP server, follow these steps:

1. In iSeries Navigator, expand **your iSeries Server** —> **Network** —> **Servers** —> **TCP/IP**.
2. Right-click **FTP** and select **Properties**.
3. On the **FTP Properties** page, select **Subsystem description**.
4. Specify a subsystem description and a predefined library.

If the specified subsystem does not exist, then FTP will create it along with routing table entries and job descriptions. When the startup job for the server is executed, it will specify the parameters for the newly created subsystem and then submit the server jobs for batch startup in that subsystem.

Use the FTP client on iSeries

The FTP client allows you to transfer files that are found on your iSeries server, including those in the Root, QSYS.Lib, QOpenSys, QOPT, and QFileSvr.400 file systems. It also allows you to transfer folders and documents in the document library services (QDLS) file system. The FTP client may be run interactively in an unattended batch mode where client subcommands are read from a file and the responses to these subcommands are written to a file. It also includes other features for manipulating files on your system.

The client has a user interface from which you can enter client subcommands for making requests to an FTP server. The results of these requests are then displayed.

To transfer files between the client and the server, two connections are established. The control connection is used to request services from the server with FTP server commands. The server sends replies back to the client to indicate how the request was handled. The second connection, called the data connection, is used for transferring lists of files and the actual file data.

Both the client and the server have a data transfer function that interfaces to the resident file systems. These functions read or write data to the local file systems and to and from the data connection.

Start and end a client session
Describes how to start and stop a client session.

Server timeout considerations
Explains how to keep your connection from timing out.

Transfer files with FTP
Describes how to send and receive files with FTP.

FTP as batch job
Provides examples of how to run FTP in an unattended mode.

Start and end a client session

This topic provides details for using the FTP client on the iSeries server.

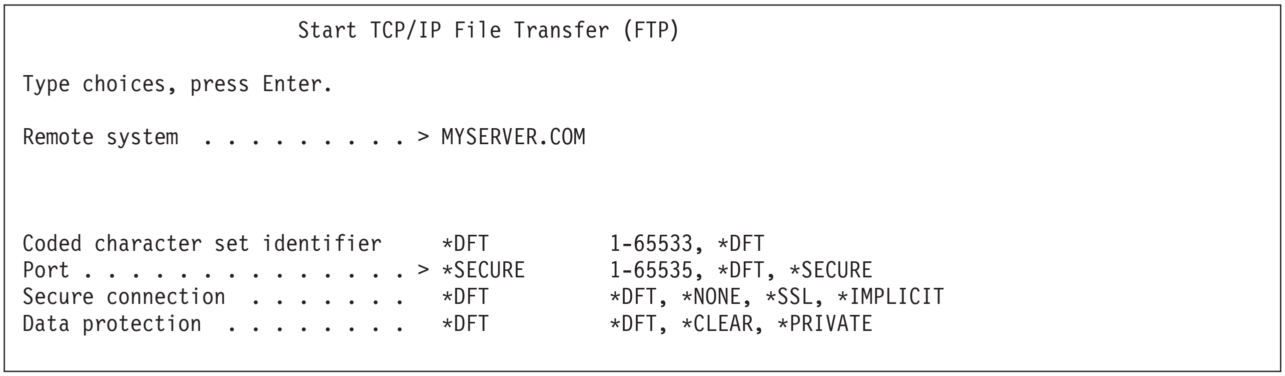
Starting FTP client sessions (See 24)
Ending the FTP client session (See 27)

Starting FTP client session

Before starting the FTP client function, you must have the following information:

- The name or Internet address of the system to which files are sent or obtained.
- A logon ID and password (if required) for the remote system where the file transfers are to occur.
- The name of the file or files with which you want to work (send and receive, for example).

The Start TCP/IP File Transfer Protocol (STRTCPFTP “remotesystem”) starts a client session on the local iSeries server and then opens a connection to the FTP server on the specified remote system. For example, entering the command `FTP myserver.com` would start a client session on your iSeries server, then open a connection to the FTP server on the remote myserver.com system. You can specify additional parameters, or be prompted for them by typing STRTCPFTP without specifying a remote system.



```
                       Start TCP/IP File Transfer (FTP)

Type choices, press Enter.

Remote system  . . . . . . . . . > MYSERVER.COM



Coded character set identifier     *DFT          1-65533, *DFT
Port . . . . . . . . . . . . . . > *SECURE       1-65535, *DFT, *SECURE
Secure connection  . . . . . . .   *DFT          *DFT, *NONE, *SSL, *IMPLICIT
Data protection  . . . . . . . .   *DFT          *DFT, *CLEAR, *PRIVATE
```

Once you specify a remote system name, you will be prompted to specify additional information. The following summarizes the options available, additional details are available in the field help:

Remote system (RMTSYS)
Specifies the remote system name to which or from which the files are transferred. The possible values are:

***INTNETADR**
The Internet address (INTNETADR) parameter is prompted. The Internet address is specified in the form, nnn.nnn.nnn.nnn, where nnn is a decimal number ranging from 0 through 255

remote-system
Specify the remote system name to which or from which the file transfer takes place.

Coded character set identifier (CCSID)
Specifies the ASCII coded character set identifier (CCSID) that is used for single-byte character set (SBCS) ASCII file transfers when the FTP TYPE mode is set to ASCII. The possible values are:

***DFT**
The CCSID value 00819 (ISO 8859-1 8-bit ASCII) is used.

CCSID-value
The requested CCSID value is used. This value is validated to ensure a valid ASCII SBCS CCSID was requested.

Port (PORT)
Specifies the port number used for connecting to the FTP server. Normally the “well-known” port value of 21 is used to connect to the FTP server. Under some circumstances, the FTP server may be contacted at a port other than port 21. In those situations, the port parameter may be used to specify the server port to connect to. The possible values are:

***DFT**
The value 00021 is used.

***SECURE**
The value 00990 is used. Port 990 is reserved for secure FTP servers which immediately use Transport Layer Security (TLS) or Secure Sockets Layer (SSL) protocols to encrypt data.

port_value
The requested port value is used. This value is validated to ensure it is in the proper range.

Note: If 990 is specified, the FTP client will perform the same functions as if *SECURE were specified.

» **Secure connection (SECCNN)**
Specifies the type of security mechanism to be used for protecting information transferred on the FTP control connection (which includes the password used to authenticate the session with the FTP server). Transport Layer Security (TLS) and Secure Sockets Layer (SSL) are compatible protocols which use encryption to protect data from being viewed during transmission and verify that data loss or corruption does not occur.

Note: The FTP client subcommand SECOPEN can be used to open a protected FTP connection during an FTP client session.

The possible values are:

***DFT**
If the PORT parameter specifies *SECURE or 990, *IMPLICIT is used; otherwise, *NONE is used.

***IMPLICIT**
The FTP client immediately attempts to use TLS/SSL when connecting to the specified FTP server (without sending an AUTH subcommand to the server). If the server does not support implicit TLS/SSL on the specified port, or the TLS/SSL negotiation fails for any reason, the connection is closed.

***SSL**
After connecting to the specified FTP server, the FTP client sends an AUTH (authorization) subcommand requesting a TLS/SSL protected session. If the server supports TLS/SSL, a TLS/SSL negotiation performed. If the server does not support TLS/SSL or the TLS/SSL negotiation fails, the connection is closed.

***NONE**
The FTP client does not use encryption for the control connection to the specified FTP server. «

» Data protection (DTAPROT)

Specifies the type of data protection to be used for information transferred on the FTP data connection. This connection is used to transfer file data and directory listings. The FTP protocol does not allow protection of the data connection if the control connection is not protected.

Note: The FTP client subcommand SECData can be used subsequently to change the data protection level. The FTP client uses the FTP server subcommand PROT to request the specified data protection after a secure control connection has been established.

The possible values are:

***DFT**
If the SECCNN parameter specifies a protected control connection, *PRIVATE is used; otherwise, *CLEAR is used.

***PRIVATE**
Information sent on the FTP data connection is encrypted. If the SECCNN parameter specifies that the FTP control connection is not encrypted, *PRIVATE cannot be specified.

***CLEAR** Information sent on the FTP data connection is not encrypted. «

Outgoing ASCII/EBCDIC table (TBLFTPOUT)

Specifies the table object that is to be used to map all outgoing data in the FTP client. Outgoing data is mapped from EBCDIC to ASCII. If no table object is specified for TBLFTPOUT, the CCSID parameter is used to determine outgoing mapping. The possible values are:

***CCSID**
The CCSID parameter is used to determine outgoing mapping.

***DFT**
The CCSID parameter is used to determine outgoing mapping.

The name of the outgoing mapping table can be qualified by one of the following library values:

***LIBL**
All libraries in the user and system portions of the job's library list are searched until the first match is found.

***CURLIB**
The current library for the job is searched. If no library is specified as the current library for the job, the QGPL library is used.

library-name
Specify the name of the library to be searched.

outgoing-mapping-table
Specify the table object to be used by the FTP client for mapping outgoing data.

Incoming ASCII/EBCDIC table (TBLFTPIN)
Specifies the table object that is to be used to map all incoming data in the FTP client. Incoming data is mapped from ASCII to EBCDIC. If no table object is specified for TBLFTPIN, the CCSID parameter is used to determine incoming mapping. The possible values are:

***CCSID**
The CCSID parameter is used to determine incoming mapping.

***DFT**
The CCSID parameter is used to determine incoming mapping.

The name of the incoming mapping table can be qualified by one of the following library values:

***LIBL**
All libraries in the user and system portions of the job's library list are searched until the first match is found.

***CURLIB**
The current library for the job is searched. If no library is specified as the current library for the job, the QGPL library is used.

library-name
Specify the name of the library to be searched.

incoming-mapping-table
Specify the table object to be used by the FTP client for mapping incoming data.

For steps for transferring files with between systems, refer to the topic Transfer Files with FTP.

Ending the FTP client session

The FTP session is ended with the QUIT subcommand. The QUIT subcommand closes the connection with the remote host and ends the FTP session on the iSeries server. Alternatively, you can press F3 (Exit) and then confirm to end the FTP client session.

Server timeout considerations

The inactivity time-out value requires some consideration. This is the time in seconds without FTP server activity that will cause the server to close the session. Certain remote servers allow the client to change this value. For example, iSeries supports the FTP server TIME subcommand, which can be sent to the server with the FTP client QUOTE subcommand, as described in QUOTE (Send a Subcommand to an FTP Server). UNIX servers often support the SITE IDLE subcommand.

When using local iSeries subcommands with either the SYSCMD subcommand or F21, there is no interaction between the client and the server. Therefore, if the running of these local iSeries commands exceeds the server inactivity time-out period, the server will close the connection. If you lose your connection, you must log on to the server again using the OPEN command (OPEN <remote system name>) and the USER command as described in the note to Logon to the Remote System (Server).

Transfer files with FTP

Follow these steps to transfer files with FTP.

1. Collect this information:
   - The TCP/IP name or IP address of the remote computer
   - A logon name and password for the remote computer (unless the remote computer supports anonymous FTP)
   - The name and location of the file you want to transfer
   - The location of the destination
   - The file transfer type that you will use: ASCII, EBCDIC, or BINARY
   - Whether you want to use a connection secured with Transport Layer Security (TLS) or Secure Sockets Layer (SSL).
2. At the command line, type **FTP** and press **Enter**.
3. At the prompt, enter the TCP/IP name or IP address of the remote computer system and press **Enter**. You can use either the name or the IP address, such as:
   ```
   remote.systemname.com
   ```
   or
   ```
   110.25.9.13
   ```
4. Enter the Coded Character Set Identifier (CCSID). Use the default (*DFT) value unless you know that you need a specific CCSID.
5. If you want to use a secure connection to protect passwords and data, specify a Port value of *SECURE.
6. Press **Enter** to initiate the connection. The FTP client will display messages that indicate a successful connection with the remote system.

   Note: If you specify a port of *SECURE and the server does not support implicit TLS/SSL on the specified port, or the TLS/SSL negotiation fails for any reason, the connection is closed.

7. To change the file transfer type, do the following:
   a. To switch to EBCDIC, enter **EBCDIC** and press **Enter** before you transfer the file.
   b. To switch to BINARY, enter **BINARY** and press **Enter** before you transfer the file.
   c. To switch back to the default type, ASCII, enter **ASCII** and press **Enter** before you transfer the file.
8. Now you are ready to transfer files:
   a. Enter **CD** and the name of the directory. Press **Enter**.
   b. Do one of the following:
      - To transfer a file from the server system to the client system, enter **GET** followed by the name of the file:

```
GET myfile.txt
```

- To send a file that is on the client system to the server system, enter **PUT** followed by the name of the file:

  ```
  PUT myfile.txt
  ```

9. Enter the FTP subcommand **QUIT** to end the FTP client session and return to the iSeries command line.

FTP as batch job

In addition to running the FTP client interactively, you can run the FTP client in an unattended mode. This topic provides two examples of this method: a simple (See 29) example and a complex (See 30) example.

You can also refer to Section 6.7, Batch FTP, of V4 TCP/IP for AS/400: More Cool Things Than Ever (about 744 pages) for another example.

Batch FTP: A simple example

The following is a simple example of a batch file transfer that involves the successful transfer of one file from a remote system.

The components are as follows:

- A CL program
- An input file of FTP commands
- An output file of FTP messages

The CL Program

```
************************************************************
   ITSOLIB1/QCLSRC BATCHFTP:
   ----------------------
       PGM
       OVRDBF   FILE(INPUT) TOFILE(ITSOLIB1/QCLSRC) MBR(FTPCMDS)
       OVRDBF   FILE(OUTPUT) TOFILE(ITSOLIB1/QCLSRC) MBR(OUT)
       FTP      RMTSYS(SYSxxx)
       ENDPGM
************************************************************
```

Note: To make this sample work when written with ILECL, you must add OVRSCOPE(*CALLLVL) to the OVRDBF commands.

The BATCHFTP program overrides the INPUT parameter to the source physical file ITSOLIB1/QCLSRC MBR(FTPCMDS). The output is sent to MBR(OUT).

The Input Commands File

```
************************************************************
ITSOLIB1/QCLSRC FTPCMDS:
---------------------
ITSO ITSO
CD ITSOLIB1
SYSCMD CHGCURLIB ITSOLIB2
GET QCLSRC.BATCHFTP QCLSRC.BATCHFTP (REPLACE
QUIT
************************************************************
```

The FTP subcommands required are shown in the FTPCMDS file.

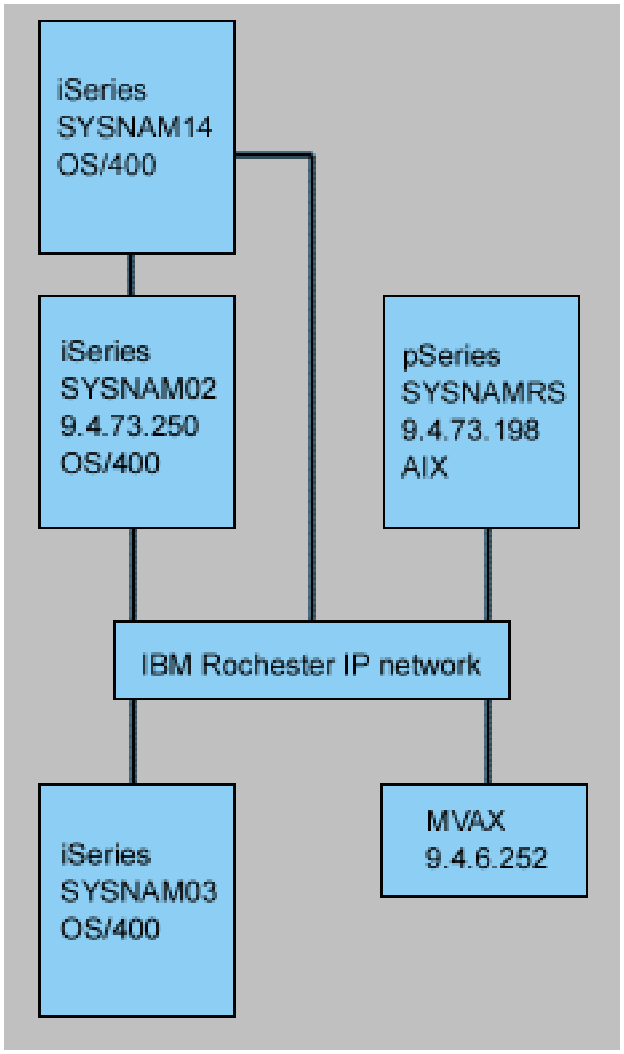
The Output Messages File

```
************************************************************
FTP Output Redirected to a File
FTP Input from Overridden File
Connecting to host name SYSxxx
at address x.xxx.xx.xxx using port 21.
220-QTCP at SYSxxx.sysnam123.ibm.com.
220 Connection will close if idle more than 5 minutes.
Enter login ID (itso):
> ITSO ITSO
331 Enter password.
230 ITSO logged on.
 OS/400 is the remote operating system.  The TCP/IP version is "V3R1M0".
250  Now using naming format "0".
257 "QGPL" is current library.
Enter an FTP subcommand.
> CD ITSOLIB1
Enter an FTP subcommand.
250 Current library changed to ITSOLIB1.
> SYSCMD CHGCURLIB ITSOLIB2
Enter an FTP subcommand.
> GET QCLSRC.BATCHFTP QCLSRC.BATCHFTP (REPLACE
200 PORT subcommand request successful.
150 Retrieving member BATCHFTP in file QCLSRC in library ITSOLIB1.
250 File transfer completed successfully.
147 bytes transferred in 0.487 seconds. Transfer rate 0.302 KB/sec.
Enter an FTP subcommand.
> QUIT
221 QUIT subcommand received.
************************************************************
```

The output file is shown. It is a straightforward matter to write a program to process this file and display an error message on QSYSOPR if there are any error messages. FTP error messages have numbers that start with a 4 or 5.

Batch FTP: A Complex Example

The following example shows how to retrieve files from several remote hosts to a central iSeries in batch mode:



*

User GWIL on iSeries SYSNAM03 wants to:

1. Retrieve files from hosts SYSNAMRS (RS/6000^R) and MVAX (VAX).
2. After retrieving the file from SYSNAMRS, the file should be transferred to SYSNAM02 (another iSeries) using FTP.
3. From there the file is to be sent using TCP/IP to iSeries SYSNAM14.

Create a CL Program to Start FTP

1. As we have seen in the previous example, FTP uses the display station for command INPUT and message OUTPUT, and this needs to be overridden for use in batch mode. We use the OVRDBF command to overwrite these files with the ones to be used in batch:

```
OVRDBF FILE(INPUT) TOFILE(GERRYLIB/QCLSRC) MBR(FTPCMDS)
OVRDBF FILE(OUTPUT) TOFILE(GERRYLIB/QCLSRC) MBR(FTPLOG)
```

2. A host name or an internet address is a required parameter for the STRTCPFTP command that is included in the CL program file. However, if one wants to specify the remote systems in the input commands file instead of the CL program file, then a dummy host name must be specified for the STRTCPFTP command to satisfy the required syntax. This dummy name may be a fictitious host name or a real host name. If it is a real name, then the first entry in the input commands file must be a user ID and a password, and the second entry must be the CLOSE subcommand. If it is not a real host name, then these entries are not required, and the first entry should be an OPEN subcommand to connect to the desired server system.

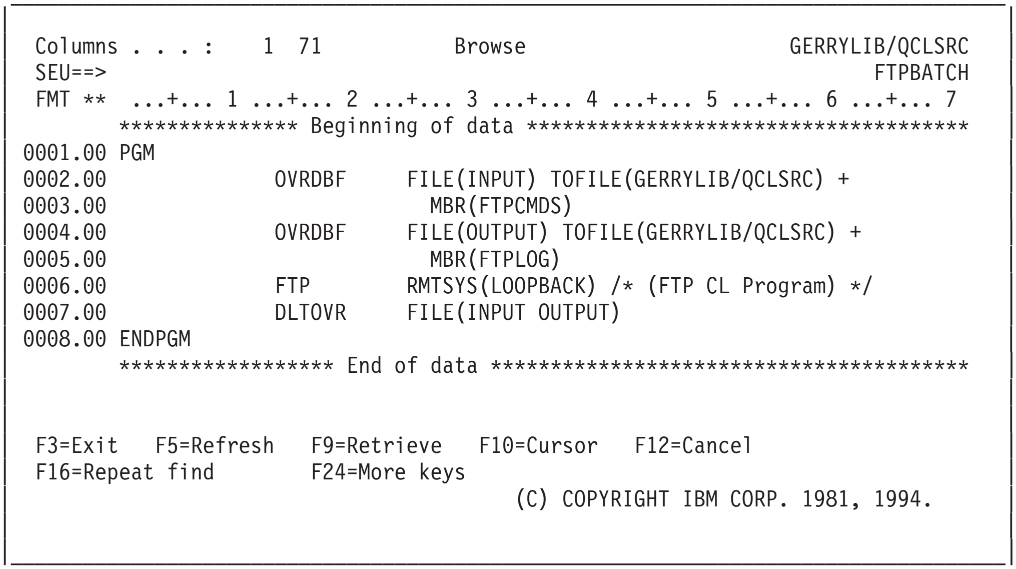
```
FTP RMTSYS(LOOPBACK)
```

FTP processes the input file and writes messages to the output file (FTPLOG).

3. After the FTP application ends, delete the overrides:

```
DLTOVR     FILE(INPUT OUTPUT)
```

The CL program for batch FTP will look like the following example on system SYSNAM01:



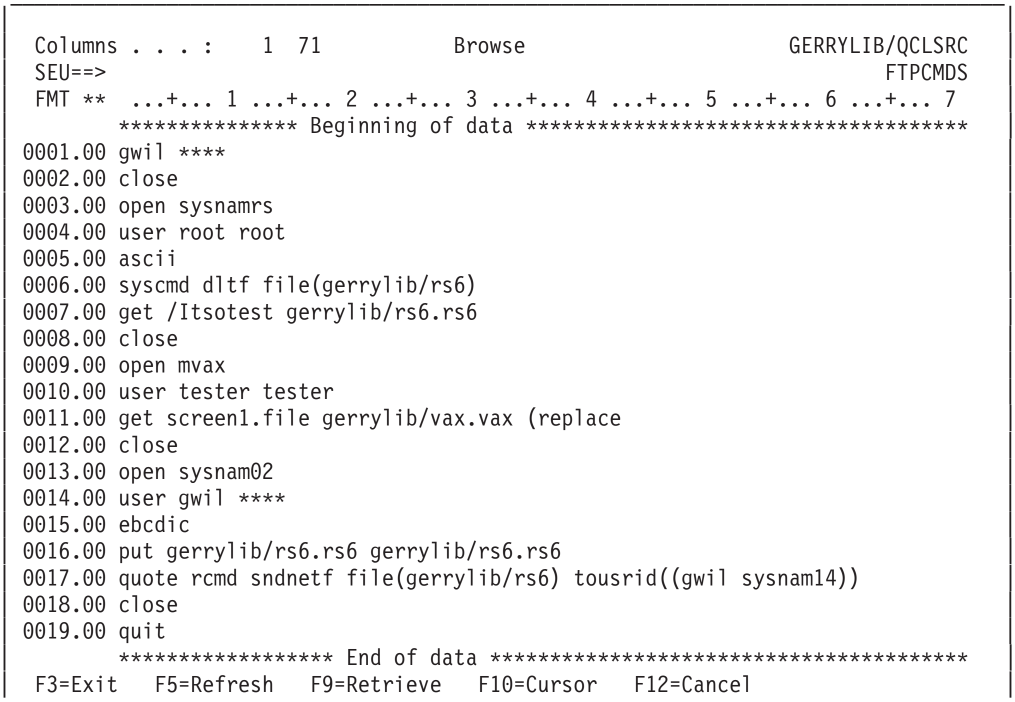
```
 Columns . . . :    1  71           Browse                    GERRYLIB/QCLSRC
 SEU==>                                                              FTPBATCH
 FMT **  ...+... 1 ...+... 2 ...+... 3 ...+... 4 ...+... 5 ...+... 6 ...+... 7
        *************** Beginning of data ************************************
        PGM
                     OVRDBF     FILE(INPUT) TOFILE(GERRYLIB/QCLSRC) +
                                  MBR(FTPCMDS)
                     OVRDBF     FILE(OUTPUT) TOFILE(GERRYLIB/QCLSRC) +
                                  MBR(FTPLOG)
                     FTP        RMTSYS(LOOPBACK) /* (FTP CL Program) */
                     DLTOVR     FILE(INPUT OUTPUT)
        ENDPGM
        ****************** End of data ****************************************


 F3=Exit   F5=Refresh   F9=Retrieve   F10=Cursor   F12=Cancel
 F16=Repeat find        F24=More keys
                                         (C) COPYRIGHT IBM CORP. 1981, 1994.
```

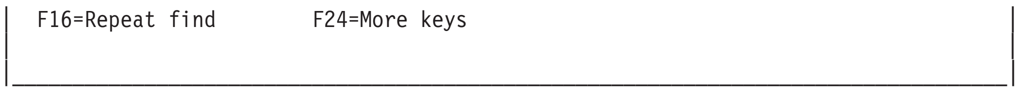
Figure 1. CL Program FTPBATCH for Batch FTP.

Create the FTP Input File (FTCPDMS)

This file has to contain all the FTP client subcommands necessary to connect and log on to the server, set up for and do the file transfers, close the server connection, and end the client session. The example in below shows the subcommands used for transferring files to two different remote systems.



```
 Columns . . . :    1  71           Browse                    GERRYLIB/QCLSRC
 SEU==>                                                               FTPCMDS
 FMT **  ...+... 1 ...+... 2 ...+... 3 ...+... 4 ...+... 5 ...+... 6 ...+... 7
        *************** Beginning of data ************************************
        gwil ****
        close
        open sysnamrs
        user root root
        ascii
        syscmd dltf file(gerrylib/rs6)
        get /Itsotest gerrylib/rs6.rs6
        close
        open mvax
        user tester tester
        get screen1.file gerrylib/vax.vax (replace
        close
        open sysnam02
        user gwil ****
        ebcdic
        put gerrylib/rs6.rs6 gerrylib/rs6.rs6
        quote rcmd sndnetf file(gerrylib/rs6) tousrid((gwil sysnam14))
        close
        quit
        ****************** End of data ****************************************
 F3=Exit   F5=Refresh   F9=Retrieve   F10=Cursor   F12=Cancel
```



```
 F16=Repeat find        F24=More keys
```

Figure 2. Transferring files to two remote systems.

The following is an explanation for the FTP client subcommands shown in Figure 2. The line numbers on the display correspond to the numbers that follow.

0001
User ID and password for dummy connection within client iSeries SYSNAM03.

0002
Close dummy connection in iSeries SYSNAM03.

0003
Open control connection to RISC System/6000^{R} SYSNAMRS.

0004
USER subcommand with user ID and password for SYSNAMRS.

Note: When running FTP in batch mode, the USER subcommand must follow an OPEN subcommand. Both the logon user ID and password parameters for the USER subcommand should be provided. This is different when operating FTP interactively online. When FTP is run interactively online, then the client will automatically initiate a USER subcommand and prompt you for a logon ID. There is no automatic USER subcommand when running FTP in batch mode.

0005
Transfer ASCII data (will be converted on iSeries to/from EBCDIC).

0006
CL command to be run on client iSeries: delete file. Instead parameter (REPLACE could be used with the next statement.

0007
Retrieve file from RISC System/6000 system

0008
Close control connection to RISC System/6000 SYSNAMRS.

0009
Open connection to VAX MVAX.

0010
USER subcommand with user ID and password for MVAX.

0011
Retrieve file from VAX replacing existing iSeries file.

0012
Close control connection to VAX MVAX.

0013
Open control connection to remote iSeries SYSNAM02.

0014
USER subcommand with user ID and password for SYSNAM02.

0015
Transfer EBCDIC data (as it is from iSeries to iSeries).

0016
Send iSeries file to iSeries SYSNAM02 with TCP/IP.

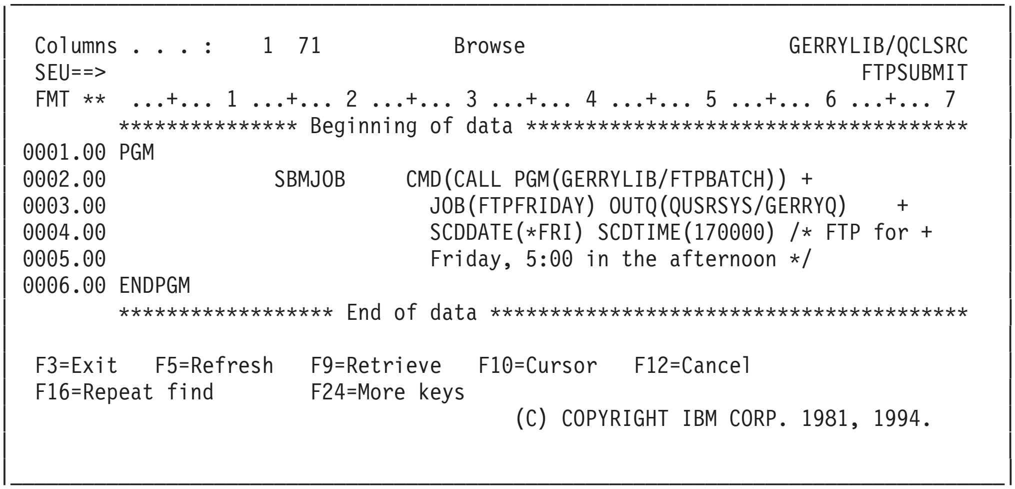
0017
Send this file from server iSeries SYSNAM03 to remote iSeries SYSNAM14 through TCP/IP network.

0018
Close control connection to iSeries SYSNAM02.

0019
End FTP application.

Create CL Program for Submitting the FTPBATCH Job

To schedule the file transfers and run them unattended, create a CL program that submits the FTPBATCH job. In the following example, the file transfers are supposed to run the next Friday, 17:00 hour, in unattended mode.



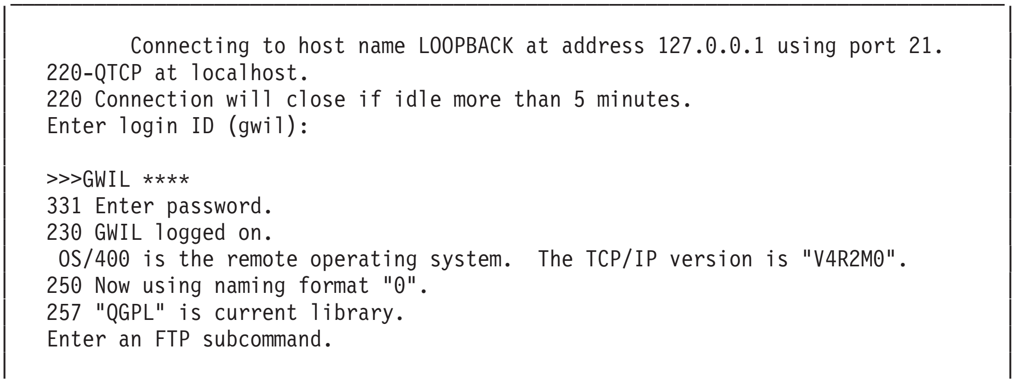
```
 Columns . . . :    1  71           Browse                      GERRYLIB/QCLSRC
 SEU==>                                                               FTPSUBMIT
 FMT **  ...+... 1 ...+... 2 ...+... 3 ...+... 4 ...+... 5 ...+... 6 ...+... 7
        *************** Beginning of data *************************************
0001.00 PGM
0002.00             SBMJOB     CMD(CALL PGM(GERRYLIB/FTPBATCH)) +
0003.00                          JOB(FTPFRIDAY) OUTQ(QUSRSYS/GERRYQ)    +
0004.00                          SCDDATE(*FRI) SCDTIME(170000) /* FTP for +
0005.00                          Friday, 5:00 in the afternoon */
0006.00 ENDPGM
        ****************** End of data ****************************************

 F3=Exit   F5=Refresh   F9=Retrieve   F10=Cursor   F12=Cancel
 F16=Repeat find        F24=More keys
                                       (C) COPYRIGHT IBM CORP. 1981, 1994.
```

Figure 3. CL Program for Submitting Batch FTP Job.

Check the FTP Output File for Errors

While running at the scheduled time, FTP creates the data in file member FTPLOG shown above. The data in file member FTPLOG corresponds to original statements found both examples.



```
        Connecting to host name LOOPBACK at address 127.0.0.1 using port 21.
  220-QTCP at localhost.
  220 Connection will close if idle more than 5 minutes.
  Enter login ID (gwil):

  >>>GWIL ****
  331 Enter password.
  230 GWIL logged on.
   OS/400 is the remote operating system.  The TCP/IP version is "V4R2M0".
  250 Now using naming format "0".
  257 "QGPL" is current library.
  Enter an FTP subcommand.
```

```
> CLOSE
221 QUIT subcommand received.
Enter an FTP subcommand.

> OPEN SYSNAMRS
Connecting to host name SYSNAMRS at address 9.4.73.198 using port 21.
220 sysnamrs.sysnam123.ibm.com FTP server (Version 4.9 Thu Sep 2 20:35:07 CDT
    1993) ready.
Enter an FTP subcommand.
```

Figure 4. FTP Output (FTPLOG) After Running FTPBATCH Program (Part 1)

```
> USER root ****
331 Password required for root.
230 User root logged in.
UNIX Type: L8 Version: BSD-44
Enter an FTP subcommand.

> ASCII
200 Type set to A; form set to N.
Enter an FTP subcommand.

> SYSCMD DLTF FILE(GERRYLIB/RS6)
Enter an FTP subcommand.

> GET /Itsotest GERRYLIB/RS6/RS7
200 PORT command successful.
150 Opening data connection for /Itsotest (467 bytes).
226 Transfer complete.
467 bytes transferred in 2.845 seconds. Transfer rate 0.167 KB/sec.
Enter an FTP subcommand.
```

Figure 5. FTP Output (FTPLOG) after Running FTPBATCH Program (Part 2)

```
> CLOSE
221 Goodbye.
Enter an FTP subcommand.

> OPEN MVAX
Connecting to host system mvax at address 9.4.6.252 using port 21.
220 FTP Service Ready
Enter an FTP subcommand.

> USER TESTER ******
331 User name TESTER received, please send password
230 TESTER logged in, directory $DISK1:[TESTER]
Enter an FTP subcommand.

GET SCREEN1.FILE GERRYLIB/VAX.VAX (REPLACE
200 PORT Command OK.
125 ASCII transfer started for $DISK1:[TESTER SCREEN1.FILE;1(266586 bytes)
226 File transfer completed ok.
265037 bytes transferred in 8.635 seconds. Transfer rate 30.694 KB/sec.
Enter an FTP subcommand.

> CLOSE
221 Goodbye.
```

```
Enter an FTP subcommand.

OPEN SYSNAM02
Connecting to host system SYSNAM02 at address 9.4.73.250 using port 21.
220-QTCP at SYSNAM02.sysnam123.ibm.com.
220 Connection will close if idle more than 5 minutes.
       Enter an FTP subcommand.
```

Figure 6. FTP Output (FTPLOG) after Running FTPBATCH Program (Part 3)

```
> USER GWIL ****
331 Enter password.
230 GWIL logged on.
 OS/400 is the remote operating system.  The TCP/IP version is "V4R2M0".
250 Now using naming format "0".
257 "QGPL" is current library.
Enter an FTP subcommand.

> EBCDIC
200 Representation type is EBCDIC nonprint.
Enter an FTP subcommand.

> PUT GERRYLIB/RS6.RS6 GERRYLIB/RS6.RS6
200 PORT subcommand request successful.
150 Sending file to member RS6 in file RS6 in library GERRYLIB.
250 File transfer completed successfully.
467 bytes transferred in 0.148 seconds. Transfer rate 3.146 KB/sec.
Enter an FTP subcommand.

> RCMD SNDNETF FILE(GERRYLIB/RS6) TOUSRID((GERRYLIB SYSNAM14))
250 Command SNDNETF FILE(GERRYLIB/RS6) TOUSRID((GWIL SYSNAM14))
    successful.
Enter an FTP subcommand.
```

Figure 7. FTP Output (FTPLOG) after Running FTPBATCH Program (Part 4)

```
> CLOSE
221 QUIT subcommand received.
Enter an FTP subcommand.
> QUIT
(This ends the FTP application)
```

Figure 8. FTP Output (FTPLOG) after Running FTPBATCH Program (Part 5)

You should check this output for errors that might have occurred during FTP processing. You can either check visually or run a program that tests for error reply codes. Three-digit FTP error reply codes start with 4 or 5. Be careful to avoid messages such as ’467 bytes transferred...’.

Sample Procedure: A sample REXX procedure and a sample physical file member are shipped as part of the TCP/IP product. File QATMPINC in library QTCP includes the following two members:

- BATCHFTP that contains REXX source code to specify the input and output batch files, and start FTP.
- BFTPFILE that contains the subcommands and data required for logon and running FTP.

FTP reference information

» The following topics provide information you may find useful when working with the FTP server and client:

FTP server subcommands
These commands represent communication between the client and server. This topic includes descriptions for iSeries CL equivalent subcommands that are unique to iSeries FTP server (See 38)

FTP client subcommands
Use FTP client subcommands to establish a connection with a remote FTP server, navigate libraries and directories, create and delete files, and transfer files.

FTP exit programs
Use FTP exit programs to secure FTP. The FTP server communicates with each exit program through a specific exit point. This topic includes parameter descriptions and code examples.

Additional reference information

- Data transfer methods
- File systems and naming conventions
- FTP server reply status messages
- FTP server syntax conventions
- FTP client syntax conventions

«

FTP server subcommands

This topic is a reference of FTP server subcommands. The FTP client communicates with the server using server subcommands. Because a user does not typically communicate with the FTP server, this topic provides the server subcommands, descriptions of what they do, their syntax conventions, and FTP reply status messages for your reference.

iSeries FTP server supports these subcommands:

Subcommand	What It Does
ABOR	Cancels the Previous Subcommand
ADDM	Adds a Member to a Physical File
ADDV	Adds a Member to a Variable-Length Member to a Physical File
APPE	Appends Data to a Specified File
AUTH	Defines the authentication mechanism used for the current FTP session.
CDUP	Changes Directory to the Parent Directory
CRTL	Creates a Library
CRTP	Creates a Physical File
CRTS	Creates a Source Physical File
CWD	Changes the Working Directory or Library
DBUG	Starts or Ends a Server Trace
DELE	Deletes a File, a Member, or a Document

Subcommand	What It Does
DLTF	Deletes a File
DLTL	Deletes a Library
HELP	Gets Information about FTP Server Subcommands
LIST	Lists Files or Directory Entries
MKD	Makes a Directory
MODE	Specifies a Format for Data Transmission
NLST	Lists the Names of Files or Directories
NOOP	Checks if Server is Responding
PASS	Sends a Password to the Server
PASV	Tells the Server to Passively Open the Next Data Connection
PBSZ	Defines the largest buffer protection buffer size to be used for application-level encoded data sent or received on the data connection.
PORT	Identifies the Data Port on which the Client Will Listen for a Connection
PROT	Defines the protection used for FTP data connections
PWD	Displays the Current Working Directory
QUIT	Logs Off the User; Closes the Connection
RCMD	Sends a CL Command to an FTP Server
REIN	Re-starts a Session on a Server
RETR	Retrieves Data from a Server
RMD	Removes a Directory
RNFR	Specifies a File to be Renamed
RNTO	Specifies a New File Name
SITE	Sends Information for a Server to Use
STAT	Gets Status Information from a Server
STOR	Saves Data on a Server and Replaces an Existing File
STOU	Saves Data on a Server But Does Not Replace an Existing File
STRU	Specifies the Structure of a File
SYST	Prints the Name of the OS on the Server
TIME	Sets the Time-Out Value for the FTP Server
TYPE	Specifies the File Transfer Type
USER	Sends a User Logon ID to the Server
XCUP	Changes to the Parent Directory
XCWD	Changes to the Working Directory
XMKD	Creates a Directory
XPWD	Displays the Current Directory or Library
XRMD	Removes a Directory

Subcommands unique to iSeries FTP server

iSeries FTP server subcommands include a special set of commands that are really abbreviated names of equivalent, but longer, iSeries CL commands. The names of these special server subcommands must be four characters to comply with the FTP architecture limits. When the iSeries server receives these subcommands, this is how it interprets them:

- ADDM = ADDPFM (Add Physical File Member)
- ADDV = ADDPVLM (Add Physical File Variable Length Member)
- CRTL = CRTLIB (Create Library)
- CRTP = CRTPF (Create Physical File)
- CRTS = CRTSRCPF (Create Source Physical File)
- DLTF = DLTF (Delete File)
- DLTL = DLTLIB (Delete Library)

In addition to these specific subcommands, you can use the FTP server subcommand RCMD to send any CL command to the server.

Related topics:

- FTP server syntax conventions
- FTP server reply status messages
- FTP client subcommands: Use these subcommands to establish a connection with a remote FTP server, navigate libraries and directories, create and delete files, and transfer files.

ADDM (Add Physical File Member)
FTP Server Subcommand

```
ADDM parameters
```

parameters
The parameters for this subcommand are the same as for the ADDPFM CL command.

For example, to add member BANANA to physical file GEORGE in library RLKAYS on an iSeries, enter this:

```
ADDM FILE(RLKAYS/GEORGE) MBR(BANANA)
```

Go To:

- FTP server subcommands
- FTP server syntax conventions

ADDV (Add Physical File Variable Length Member)
FTP Server Subcommand

```
ADDV parameters
```

parameters
The parameters for this subcommand are the same as for the ADDPVLM CL command.

For example, to add member POLEBEAN to physical file GEORGE in library RLKAYS on an iSeries, enter this:

```
ADDV FILE(RLKAYS/GEORGE) MBR(POLEBEAN)
```

Go To:

- FTP server subcommands
- FTP server syntax conventions

APPE (Append to Existing File)
FTP Server Subcommand

The APPE FTP server subcommand accepts the transferred data and stores it in a file on the server system. If the file specified exists, it appends the data to that file; otherwise, it creates the specified file.

```
APPE filename
```

filename
The file that will receive your on the server system.

Go To:

- FTP server subcommands
- FTP server syntax conventions

AUTH (Authorization)
FTP Server Subcommand

The AUTH FTP server subcommand defines the authentication/security mechanism that is used for the current FTP session. The syntax of this subcommand is:

AUTH [TLS-C | TLS-P | TLS | SSL]

Parameter values:

TLS-C	Utilize the transport layer security (TLS) protocol as the security mechanism. The security settings for the data connection use the RFC2228 defaults; i.e., there is no implicit protection of the data connection.
TLS-P	Utilize the TLS protocol as the security mechanism. Also, implicitly protect the data connection (which is equivalent to the command sequence AUTH TLC-C, PBSZ 0, PROT P)
TLS	Synonym for TLS-C.
SSL	Synonym for TLS-P.

Note: The TLS protocol is compatible with the secure sockets layer (SSL) protocol.

Go To:

- FTP server subcommands
- FTP server syntax conventions

CRTL (Create Library)
FTP Server Subcommand

```
CRTL parameters
```

parameters
The parameters for this subcommand are the same as for the CRTLIB CL command.

For example, to create a library that is called TESTTCP on an iSeries server, enter this:

```
CRTL TESTTCP
```

Go To:

- FTP server subcommands
- FTP server syntax conventions

CRTP (Create Physical File)
FTP Server Subcommand

```
CRTP parameters
```

parameters
The parameters for this subcommand are the same as for the CRTPF CL command.

For example, to create a physical file that is called MYFILE with a record length of 80 and no restrictions on the number of members, enter this:

```
CRTP FILE(RLKAYS/MYFILE) RCDLEN(80) MAXMBRS(*NOMAX)
```

Go To:

- FTP server subcommands
- FTP server syntax conventions

CRTS (Create Source Physical File)
FTP Server Subcommand

```
CRTS parameters
```

parameters
The parameters for this subcommand are the same as for the CRTSRCPF CL command.

For example, to create a source physical file that is called GEORGE in library RLKAYS, enter this:

```
CRTS FILE(RLKAYS/GEORGE)
```

Go To:

- FTP server subcommands
- FTP server syntax conventions

CWD (Change working directory or library)
FTP Server Subcommand

To change the working directory, library, or file group, use the CWD FTP server subcommand.

CWD *directory*

Go To:

- FTP server subcommands

- FTP server syntax conventions

DBUG (Turn on the FTP Server Trace)

Note: Use the FTP server trace only for reporting software problems to IBM. You may affect system performance by this function.

FTP Server Subcommand

```
DBUG
```

If the FTP server trace is not active, the server starts a trace. The server continues to run a trace until it receives another DBUG subcommand or a QUIT subcommand. When it ends the trace, there may be a significant delay while it formats the trace data.

Go To:

- FTP server subcommands
- FTP server syntax conventions

DELE (Delete file or document)

FTP Server Subcommand

To delete a file, a member, or a document, use the CWD FTP server subcommand.

```
DELE remotefile
```

Go To:

- FTP server subcommands
- FTP server syntax conventions

DLTF (Delete File)

FTP Server Subcommand

```
DLTF parameters
```

parameters
The parameters for this subcommand are the same as for the DLTF CL command.

For example, to delete file MYFILE in library RLKAYS, enter this:

```
DLTF FILE(RLKAYS/MYFILE)
```

Go To:

- FTP server subcommands
- FTP server syntax conventions

DLTL (Delete Library)

FTP Server Subcommand

```
DLTL parameters
```

parameters
The parameters for this subcommand are the same as for the DLTLIB CL command.

For example, to delete a library, enter this:

```
DLTL libname
```

Go To:

- FTP server subcommands
- FTP server syntax conventions

HELP (Getting Help from an iSeries Remote Server)

To get information about the FTP server subcommands, use the HELP subcommand in this format:

```
HELP [subcommand]
```

subcommand
The name of the server subcommand you want information about. For example, `HELP ADDM` will provide help information about how to add a member to a physical file on an iSeries.

To determine the syntax of the ADDV subcommand that is used by the iSeries server, use the server subcommand:

```
HELP ADDV
```

Go To:

- FTP server subcommands
- FTP server syntax conventions

LIST (File List)

FTP Server Subcommand

To get a list of directory entries, library contents, or files in a file group, use the LIST FTP server subcommand:

```
LIST [directory | name]
```

It lists only those files that FTP can transfer

Go to:

- FTP server subcommands
- FTP server syntax conventions
- SITE (Send Information Used by a Server System): Use this subcommand to change what the LIST subcommand returns.
- LIST information in UNIX-style format: Use this subcommand to show what the LIST subcommand returns.
- LIST Information in iSeries format: Use this subcommand to show what the LIST subcommand returns.

MKD (Make directory)
FTP Server Subcommand

To create or make a directory, use the MKD FTP server subcommand.

```
MKD directoryname
```

Go To:

- FTP server subcommands
- FTP server syntax conventions

MODE (Set Transfer Mode)
FTP Server Subcommand

To specify how to you want bits of data transmitted, specify the mode, or data format, by using the MODE FTP server subcommand:

```
MODE [B | S]
```

B
Specifies block mode. In this mode, data is a series of data blocks, preceded by one or more header bytes.

S
Specifies stream mode. In this mode, data a stream of bytes. You can use any representation type with stream mode. This transfer mode is more efficient because the server does not transfer any data block information.

Notes:

1. Stream mode is the default transfer mode the iSeries server uses and is the preferred mode.
2. If there is no parameter, the server returns a reply that indicates the present setting for MODE.

Go To:

- FTP server subcommands
- FTP server syntax conventions

NLST (Name List)
FTP Server Subcommand

To get a list of only the names of multiple files, a file group, a directory, or a library, use the NLST FTP server subcommand:

```
NLST [directory | name]
```

It lists only those files that FTP can transfer.

Go To:

- FTP server subcommands

- FTP server syntax conventions

NOOP (Obtain Server Response)

FTP Server Subcommand

The NOOP FTP server subcommand sends an “OK” reply to the client. It does not affect server processing in any other way. The client uses this command to determine if the server is connected and responding. Use the NOOP subcommand:

```
NOOP
```

Go To:

- FTP server subcommands
- FTP server syntax conventions

PASS (Password)

FTP Server Subcommand

```
PASS password
```

password
A string that specifies your password for the server system.

Note: The USER server subcommand must immediately precede the server subcommand PASS immediately.

Go To:

- FTP server subcommands
- FTP server syntax conventions

PASV (Use Passive Data Connection)

FTP Server Subcommand

To instruct this server to passively open the next data connection, use the PASV FTP server subcommand in this format:

```
PASV
```

Go To:

- FTP server subcommands
- FTP server syntax conventions

PBSZ (Protection Buffer Size)

FTP Server Subcommand

The PBSZ subcommand defines largest buffer size to be used for application-level encoded data sent or received on the data connection. The syntax of this subcommand is:

```
PBSZ value
```

where *value* is an ASCII character string representing a decimal integer.

Note: RFC2228 requires that the PBSZ subcommand be issued prior to the PROT subcommand. However, TLS/SSL handles blocking of data, so '0' is the only value accepted.

Go To:

- FTP server subcommands
- FTP server syntax conventions

PORT (Data Port)
FTP Server Subcommand

To identify the port on which the client will listen for a data connection, use the PORT FTP server subcommand in this format:

```
PORT h1,h2,h3,h4,p1,p2
```

h*n*
Represents the system IP address and is a character string that is a decimal value between 0 and 255.

p*n*
Represents the TCP port number and is a character string that is a decimal value between 0 and 255.

To convert the `p1` and `p2` values to a TCP port number, use this formula:

```
port = ( p1 * 256 ) + p2
```

For example, in this PORT subcommand:

```
PORT 9,180,128,180,4,8
```

the port number is 1032 and the IP address is 9.180.128.180.

Note: After the server closes the connection, it cannot connect to the same client IP address and port number until a two-minute time delay has occurred as specified in TCP/IP RFC 1122. The server can make a connection to the same client IP address on a different port number without this restriction.

Go To:

- FTP server subcommands
- FTP server syntax conventions

PROT (Data Channel Protection Level)
FTP Server Subcommand

The PROT subcommand defines the protection used for FTP data connections (which are used to transmit directory listings and file data). The syntax of this subcommand is:

PROT [C | P]

Parameter values:

C	Clear. The data connection carries “raw data” of the file transfer with no security applied.
P	Private. The data connection will use TLS/SSL, which provides Integrity and Confidentiality protection.

Go To:

- FTP server subcommands
- FTP server syntax conventions

PWD (Display Working Directory or Library)
FTP Server Subcommand

The server returns a reply to the client with the name of the current directory or library when the PWD FTP server subcommand:

```
PWD
```

Go To:

- FTP server subcommands
- FTP server syntax conventions

QUIT (End an FTP Server Session)
FTP Server Subcommand

The FTP server subcommand QUIT logs off the client user and closes the control connection. If a file transfer is in progress, the connection remains open until the file transfer is complete, and then the server closes it.

```
QUIT
```

Go To:

- FTP server subcommands
- FTP server syntax conventions

RCMD (Send a CL Command to an FTP Server System)
FTP Server Subcommand

Use the server subcommand RCMD to run iSeries control language (CL) commands on the FTP server system. The length of the RCMD subcommand string is up to 1000 characters. Because no prompting is available for the RCMD subcommand, the RCMD subcommand string must include all necessary parameters to run the CL command.

If the CL command called through the RCMD subcommand runs successfully, a message is displayed that states that the subcommand was successful. If an error occurred, it displays a message that states there was an error. The message does not include what the error was unless the error occurred because a library, file, or member name was not valid.

This is an example of using RCMD to run a Delete File (DLTF) command:

```
QUOte RCMD DLTF FILE(mylib/myfile)
```

`mylib` is the name of the library from which the file is to be deleted. `myfile` is the name of the file to be deleted.

Go To:

- FTP server subcommands
- FTP server syntax conventions

You may also be interested in reading about the REXEC server, which provides an alternative method for executing CL commands on a remote system.

REIN (Reinitialize Session between Systems)
FTP Server Subcommand

```
REIN
```

The REINITIALIZE subcommand:

1. Allows the completion of any transfer in progress
2. Ends the USER session and removes all input/output and account information
3. Resets all server parameters to the default settings
4. Leaves the control connection open

Go To:

- FTP server subcommands
- FTP server syntax conventions

RETR (Retrieve file)
FTP Server Subcommand

To retrieve data from the server system, use the RETR FTP server subcommand.

```
RETR remotefile
```

Go To:

- FTP server subcommands
- FTP server syntax conventions

RMD (Remove directory)
FTP Server Subcommand

To remove a directory, use the RMD FTP server subcommand.

```
RMD directoryname
```

Go To:

- FTP server subcommands
- FTP server syntax conventions

RNFR (Rename From)
FTP Server Subcommand

The RNFR FTP server subcommand renames files. It must be immediately followed by a RNTO (Rename To) server subcommand.

```
RNFR filename
```

filename
The name of the file you want renamed.

Note: The iSeries server cannot rename a file to a different file system.

Go To:

- FTP server subcommands
- FTP server syntax conventions

RNTO (Rename To)
FTP Server Subcommand

The RNTO FTP server subcommand specifies the new file name when renaming files on the server system. It must immediately follow an RNFR subcommand, which specified the file name.

```
RNTO filename
```

filename
The name to which the file you want renamed.

Note: The iSeries server, cannot rename a file to a different file system.

Go To:

- FTP server subcommands
- FTP server syntax conventions

SITE (Send Information Used by a Server System)
FTP Server Subcommand

To send information that is used by the server system or to provide services specific to the server system, use the SITE FTP server subcommand in this format:

```
SITE [parameters]
```

iSeries FTP server supports these parameters for the SITE subcommand:

LISTFMT 0
The server returns information for the LIST subcommand in LIST Information in iSeries format, which was introduced in V3R1M0. The iSeries client supports both the iSeries format and the UNIX-style format

LISTFMT 1
The server returns information for the LIST subcommand in LIST information in UNIX-style format. The name of the file is the last item of each line returned. The iSeries client supports both the iSeries format and the UNIX-style format

LISTFMT
Return a message that indicates the current FTP server LISTFMT setting.

Notes:

If you want to change the LISTFMT default on the server, then use the LISTFMT option of the CHGFTPA command. You can also use iSeries Navigator to set this FTP server property:

1. In iSeries Navigator, expand **your iSeries server** —> **Network** —> **Servers** —> **TCP/IP**.
2. In the right pane, right-click **FTP** and select **Properties**.
3. Click the **Initial Formats** tab.
4. Under the **File List** heading, enable iSeries or UNIX as the LISTFMT default on the server.
5. Click **OK** to accept the changes.

NAMEFMT 0
Use the LIBRARY/FILE.MEMBER name format. This name format is only for library file system database files.

NAMEFMT 1
Use the path name format. This name format is for all file systems that are supported by FTP that includes the library file system. Name format 1 must be used to work with all iSeries file systems other than the library file system.

NAMEFMT
Return a message that contains the current server file name format.

Note:

You can configure the iSeries FTP server the default NAMEFMT setting with the NAMEFMT option of the CHGFTPA command.

CRTCCSID *CALC
New database files created during ASCII file transfers use the related default EBCDIC CCSID of the ASCII file transfer CCSID.

CRTCCSID *USER
New database files created during ASCII file transfers use the current job CCSID. If this CCSID is 65535, the default CCSID is determined by the language id specifies the current job.

CRTCCSID *SYSVAL
New database files created during ASCII file transfers use the CCSID that was specified by the QCCSID system value.

CRTCCSID [CCSID-number]
Specify the CCSID when creating database files on the client during ASCII file transfers. The server validates this value.

CRTCCSID
Display a message that contains the current FTP client CRTCCSID setting.

NULLFLDS 0
The server does not allow transfer of database files that contain NULL fields. This is the default.

NULLFLDS 1
The server allows transfer of database files that contain NULL fields.

Note: Transfer of files that contain NULL fields requires both the client and server to have this setting enabled. If the server transfers a file that contains NULLfields to a non-iSeries server, or if the transfer type results in codepage conversion of the data, then results are unpredictable.

NULLFLDS
Return a message that indicates the current FTP server NULLFLDS setting.

TRIM 0
Set Trim option to OFF. The server sends trailing blanks of database records.

TRIM 1
Set Trim option to ON. The server does not send trailing blanks of database records when transferring database files that use file structure and stream mode. This is the default.

TRIM 2
The server does not send trailing blanks of database records for all transfers, including record structure and block mode.

TRIM
Returns a message that indicates the current setting of the FTP server Trim option.

Notes:

1. Prior to the availability of this subcommand, trailing blanks of QSYS.LIB file system records were always removed before transferring the file to the server system.
2. TRIM settings do not apply to TYPE I (binary) file transfers. Blanks are never trimmed for TYPE I file transfers, regardless of the TRIM setting.

Go To:

- FTP server subcommands
- FTP server syntax conventions

STOR (Store File)
FTP Server Subcommand

To save data on the server system and overlay an existing file, use the STOR FTP server subcommand in this format:

```
STOR remotefile
```

Go To:

- FTP server subcommands
- FTP server syntax conventions

STOU (Store Unique)
FTP Server Subcommand

To save data on the server system and not overlay an existing file, use the STOU FTP server subcommand:

```
STOU remotefile
```

The server generates a unique file name. The name assigned to the file will appear in the reply that is sent back to the client.

Go To:

- FTP server subcommands
- FTP server syntax conventions

STRU (Specify File Structure)
FTP Server Subcommand

To specify the structure of a file as a continuous sequence of data bytes, use the STRU FTP server subcommand in this format:

```
STRU [F | R]
```

F
A file structure. The file structure is a continuous sequence of data bytes.

R
A record structure. The file is a sequence of sequential records.

Notes:

1. The file structure affects the transfer mode and the interpretation and storage of a file.
2. If there is no parameter, the server returns a reply that indicates the present specification for file structure.

Go To:

- FTP server subcommands
- FTP server syntax conventions

SYST (Identify the Name of the Operating System)
FTP Server Subcommand

To obtain the name of the operating system on the server system, use the SYST FTP server subcommand:

```
SYST
```

The returned information is system dependent.

iSeries server includes the TCP/IP version.

Here is an example server reply:

```
OS/400 is the remote operating system. The TCP/IP version is "V4R4M0".
```

Go To:

- FTP server subcommands
- FTP server syntax conventions

TIME (Set Time-Out Values for FTP Server)

FTP Server Subcommand

After the FTP control connection is established between the FTP client and the FTP server, the FTP server controls the time-out for this connection. This is the inactivity time-out value.

There is also a time-out value for the data connection, known as the transfer time-out.

The format of the TIME FTP server subcommand is:

```
TIME inactivity [transfer]
```

inactivity
The number of seconds the server waits before ending the connection with the client. Inactivity time-out values can range from 1-9,999,999 seconds. The default inactivity time-out value is 300 seconds.

transfer
The file transfer time-out in seconds. This parameter is optional. If you do not specify this parameter, then the server does not change the current value. Transfer time-out values can range from 1-9,999,999 seconds. The default transfer time-out value is 420 seconds.

For example, to set the inactivity time-out value of the FTP server to 1000 seconds, and keep the current value of the transfer time-out, enter this:

```
QUOTE TIME 1000
```

The TIME subcommand is not a standard FTP subcommand. It is iSeries FTP server specific.

Go To:

- FTP server subcommands
- FTP server syntax conventions

TYPE (Specify Representation Type)

FTP Server Subcommand

To specify the file-transfer type or the representation in which the transfer is to take place, use the TYPE FTP server subcommand in this format:

```
TYPE   [ A
       | B [ 1 | 2 | 3 [A|R] | 4 [A|R  ] | 5 | 6 | 7]
       | C ccsid#
       | E
       | F [ 1 ]
       | I ]
```

A
Specifies the transfer type as the default (ASCII) transfer type. The server does not associate any vertical format control with the file. The server only supports the default format NON PRINT for ASCII. The ASCII transfer type is for the transfer of text files, except when both systems use the EBCDIC type.

Note: The CCSID for TYPE A is the CCSID value of the FTP server configuration attributes. You can change these attributes with the CHGFTPA command.

B
Shift JIS Kanji (CCSID 932)

B 1
Shift JIS Kanji (CCSID 932)

B 2
Extended UNIX Code Kanji (CCSID 5050)

B 3
JIS 1983 using ASCII shift-in escape sequence (CCSID 5054)

B 3 A
JIS 1983 using ASCII shift-in escape sequence (CCSID 5054)

B 3 R
JIS 1983 using JISROMAN shift-in escape sequence (CCSID 5052)

B 4
JIS 1978 using ASCII shift-in escape sequence (CCSID 5055)

B 4 A
JIS 1978 using ASCII shift-in escape sequence (CCSID 5055)

B 4 R
JIS 1978 using JISROMAN shift-in escape sequence (CCSID 5053)

B 5
Hangeul (CCSID 934)

B 6
Korean Standard Code KSC-5601, 1989 version (CCSID 949)

B 7
Traditional Chinese (5550) (CCSID 938)

C
Specifies the transfer type to any CCSID (coded character set identifier) that is installed on the system. The CCSID number must follow C.

E
Specifies the transfer type as EBCDIC. The server does not associate any vertical format control with the file. The server supports only the default format NON PRINT for EBCDIC. The EBCDIC transfer type is for efficient transfer between systems that use EBCDIC for their internal character representation.

F
IBM EBCDIC Kanji (CCSID 5035)

F 1
IBM EBCDIC Kanji (CCSID 5035)

I
Specifies the transfer type as image. With the image transfer type, data is a string of bits, packed into 8-bit bytes. The image transfer type efficiently stores and retrieves files and transfers binary data such as object code.

Go To:

- FTP server subcommands
- FTP server syntax conventions

USER (Send a User Logon ID to the Server)

FTP Server Subcommand

```
USER username
```

username
The user profile on an iSeries server.

Note: If the USER subcommand is successful and the iSeries server is configured for password security, then the server sends a reply to the client requesting a password. The client sends the password to the server with the server subcommand PASS. Thes is no password prompt when the server is running at security level 10.

Go To:

- FTP server subcommands
- FTP server syntax conventions

FTP client subcommands

File Transfer Protocol (FTP) subcommands instruct the FTP client to transfer files from one computer to another. With FTP client subcommands, you can establish a connection with a remote FTP server, navigate libraries and directories, create and delete files, and transfer files.

You can access descriptions about client subcommands and their syntax from the following topics.

iSeries FTP client supports these subcommands. This table identifies client subcommands, the accepted abbreviations, and each subcommand's function.

Subcommand	**What It Does**
?	Describes How to Use FTP
ACCT	Sends a User's Account Information to a Remote System
APPEND	Adds a Local File Member to File on a Remote System
ASCII	Sets the File Transfer Type to ASCII Format
BINARY	Sets the File Transfer Type to BINARY format
CD	Changes the Working Directory on Remote System

Subcommand	What It Does
CDUP	Changes to the Parent Directory on Remote System
CLOSE	Ends a Session with the Remote System
DEBUG	Turns Debugging On or Off
*DEBUG	Changes Client Time-out Values
DELETE	Deletes a File on the Remote System
DIR	Displays Directories and Files on the Remote System
EBCDIC	Sets the File Transfer Type to EBCDIC Format
GET	Copies a File from the Remote to a Local System
HELP	Gets Information about FTP Client Subcommands
LCD	Changes the Working Directory on Local System
LOCSITE	Specifies Local Site Information
LOCSTAT	Displays Local Status Information
LPWD	Displays the Working Directory on Local System
LS	Lists the Names of Files in a File Set on Remote System
LTYPE	Specifies the File Transfer Type on the Local System
MDELETE	Deletes Multiple Files on the Server System
MGET	Copies File or Files from the Remote System
MKDIR	Creates a Directory or Subdirectory
MODE	Specifies a Data Format for File Transfer
MPUT	Sends Local File or Files to the Remote System
NAMEFMT	Specifies a File Naming Format to Use
NOOP	Checks for a Response
NULLFLDS	Allows for NULL Fields
OPEN	Connects to an FTP Server
PASS	Sends a User’s Password
PUT	Copies a Local File Member to Remote System
PWD	Displays the Current Directory of Remote System
QUIT	Ends an FTP Session
QUOTE	Sends a Subcommand to an FTP Server
REINITIALIZE	Re-starts a Session on a Remote System
RENAME	Renames a File on a Remote System
RESET	Clears the Server Reply Queue
RMDIR	Removes a Directory on the Remote System
SECDATA	Specifies the protection level used for the data connection when there is a secure connection established with an FTP server.
SECOPEN	Opens a secure control connection to an FTP server using the specified security protocol.
SENDPASV	Specifies Whether a PASV Subcommand is Sent
SENDPORT	Specifies Whether a PORT Subcommand is Sent
SENDSITE	Specifies Whether a SITE Subcommand is Sent
SITE	Sends Information for Use by a Remote System

Subcommand	What It Does
STATUS	Gets Status Information from a Remote System
STRUCT	Specifies the File Structure of Data Being Sent
SUNIQUE	Controls File Replacement
SYSCMD	Runs a CL Command on a Local System Without Quitting FTP
SYSTEM	Displays the OS on the Remote System
TYPE	Specifies the File Transfer Type
USER	Sends a User ID to a Remote System
VERBOSE	Controls the Display of FTP Server Replies

Related topics:

- FTP client syntax conventions
- FTP server subcommands
- FTP server reply status messages: Access common reply codes and what they indicate.

ACCT (Send Account Information)

FTP Client Subcommand

Some systems require account information to enable certain system functions. The remote system prompts you for such information. To send account information, use the Account (ACCT) FTP client subcommand:

```
ACCT account-information
```

account-information
A string that identifies the user's account. Account information can take the form of a password that the host system uses to grant privileges. This password is not your user password, but rather it is a password on the remote system.

For example, TCP/IP on the IBM Virtual Machine (VM) Operating System may require a password for read and write access to minidisks. Use the ACCT subcommand to supply a password for the minidisk of the current directory. If the remote system is an iSeries, the ACCT subcommand performs no operation.

Go To:

- FTP client subcommands
- FTP client syntax conventions

APPEND (Append a Local File Member to a Remote File)

FTP Client Subcommand

To add a local file member, document, or other file system file to a remote file, use the APPEND FTP client subcommand in this format:

```
APpend localfile [remotefile]
```

localfile
The name of the local file member, document, or other iSeries file. The name of the hierarchical file system (HFS) file added to a directory on the remote system. For information on file naming, see NAMEFMT (Select File Naming Format).

remotefile
The file on the remote system. If you do not enter a remote file, the FTP client creates a default name. For information on how FTP creates default names, see Default file names for client transfer subcommands.

If the remote file does not exist on the server, the FTP server creates it.

To add a file on the remote system, you must have write privileges to it. You may have to supply the appropriate account information by using the ACCT subcommand (see ACCT (Send Account Information)).

The default file copy mode is stream. You may need to change this by using the MODE subcommand. In the case of fixed-record format in the remote file, the server preserves the file format and record length of the remote file. Records from the local file member shorten or include blanks when necessary.

Go To:

- FTP client subcommands
- FTP client syntax conventions

ASCII (Change File Type to ASCII)

FTP Client Subcommand

```
AScii
```

There are two basic file types you can use when transferring files with FTP: ASCII and BINARY. ASCII files are plain text files. They may have extensions like .txt or have no extension at all. BINARY files are programs or other non-text files saved in the file format of the application that created them or archived or compressed file formats.

Use the ASCII transfer type when transferring text files to or from an ASCII system that does not support EBCDIC representation. ASCII is the default transfer type. The server does not associate a vertical format control to the file. ASCII only supports the default format NON PRINT.

Go To:

- FTP client subcommands
- FTP client syntax conventions

BINARY (Set Transfer Type to Image)

FTP Client Subcommand

```
Binary
```

There are two basic file types you can use when transferring files with FTP: ASCII and BINARY. ASCII files are plain text files. They may have extensions like .txt or have no extension at all. BINARY files are programs or other non-text files saved in the file format of the application that created them or archived or compressed file formats.

If you are transferring binary data to an existing iSeries file, the record length is the record length of the existing iSeries file. For example the existing file size should accommodate the new data. If the file does not exist on an iSeries server, FTP chooses a record length for you.

Certain files, such as save files, require binary image transfer. If TYPE is not binary when attempting to transfer such files, you receive a message that tells you to use binary.

Go To:

- FTP client subcommands
- FTP client syntax conventions

CD (Change Working Directory or Library)
FTP Client Subcommand

Use the Change Directory (CD) FTP client subcommand to change the working directory, library, or file group on the remote system:

```
CD directory
```

directory
The name of a file directory, library, or other system-dependent file-group designator on the remote system.

If the remote system is an iSeries, this subcommand changes the current library or directory. To find out what directories are on the remote system, use the Directory (DIR) subcommand to get a listing.

Use the DIR subcommand with caution. See DIR (List Directory Entries, Libraries, or Files) for further details and advice.

Note: When using the subcommand CD (or LCD) to change from one iSeries file system to another, you must specify the root directory of the file system that contains the new current directory.

Go To:

- FTP client subcommands
- FTP client syntax conventions

CLOSE (End an FTP Session with the Remote System)
FTP Client Subcommand

To end your session with the remote system and keep FTP active on your local iSeries, use the CLOSE FTP client subcommand:

```
CLose
```

The CLOSE subcommand allows you to remain in the FTP environment to open another FTP session on another system. Use the OPEN subcommand to establish a new connection with the same remote system or another remote system. Use the QUIT subcommand to end FTP service and return to the iSeries environment from which FTP was started.

Go To:

- FTP client subcommands
- FTP client syntax conventions

DEBUG (Create Client Trace and Control Display of Server Subcommands Sent to Remote System)

Note:

You should only use the FTP client trace to report software problems to IBM. System performance may be adversely affected by this function.

This capability is available in release V4R4 and above of OS/400.

FTP Client Subcommand

To produce an FTP client trace or display, use the DEBUG FTP client subcommand. The DEBUG subcommand toggles the debugging mode. If the client specifies an optional debug-value, it will use it to set the debugging level. When debugging is on, the client displays with the string ’>>>’. You must set the debug-value to 100 to produce an FTP client trace.

```
DEBug [debug value]
```

debug value
If the debug-value is 0, debugging is off. If the debug-value is a positive integer, debugging is on. If you don’t specify a value, the debug value toggles from zero to one or from a positive integer to zero.

100
Initiate an FTP client trace. The client continues running the trace until the DEBUG is off or until the server ends the FTP client. When the server ends the trace, there may be a significant delay while it formats the trace data.

To initiate a trace immediately when the FTP client starts, you need to create the QTMFTPD100 data area in the QTEMP library by using this command:

```
CRTDTAARA DTAARA(QTEMP/QTMFTPD100) TYPE(*LGL) AUT(*USE)
```

If the QTMFTPD100 data area exists, then it will set the debug value to 100 and start an FTP client trace. The purpose of this capability is to enable the FTP client debug traces in those situations when an FTP client trace *cannot* start with the DEBUG 100 subcommand.

Go To:

- FTP client subcommands
- FTP client syntax conventions

DEBUG (Change Client Time-Out Limit Values)

FTP Client Subcommand

To change the client time-out limits when the default time-out values are not long enough for a data transfer to complete successfully, use the DEBUG subcommand. You should only need to change these values in situations where network traffic or other conditions cause transfer times to become quite large.

To change the FTP client time-out values, use the DEBUG FTP client subcommand:

```
 DEBug T1 | T2 [ value ]
```

T1
Change or display the FTP client time-out limit for reading server replies. If the FTP client does not receive an expected server reply within this time limit, the client will close the control connection to the server. **T2**

Change or display the FTP client time-out limit for transferring data. If the FTP client does not receive an expected data connection response within this time limit, the client will close the data connection to the server.

value
The time-out limit in seconds. This value must be a positive number greater than zero. When you omit this value, the client displays the current value of the time-out limit.

For example:

```
DEBUG T1 900
```

This value sets the client time-out value for server replies to 900 seconds.

Go To:

- FTP client subcommands
- FTP client syntax conventions

DELETE (Delete a File on a Remote System)
FTP Client Subcommand

Use the DELETE subcommand to delete a file or database file member on a remote system. The DELETE FTP client subcommand format is:

DELete *remotefile*

remotefile
The file you want to delete on the remote system. For information on how to specify the file if the remote system is an iSeries server, see NAMEFMT (Select File Naming Format).

The remote system may prompt you for authorization to delete a file. Use the ACCT (Send Account Information) subcommand to respond to that request.

You may also want to refer to:

- MDELETE (Delete Multiple Files on a Remote System)
- FTP client subcommands
- FTP client syntax conventions

DIR (List Directory Entries, Libraries, or Files)
FTP Client Subcommand

The DIR FTP client subcommand displays libraries and their contents or the remote system's list of directories and directory entries. Use the Directory (DIR) subcommand in this format:

DIr [*name*] [(Disk]

name
The name of the directory or library. The default is the entire current directory or library. To make a

library or directory current, use the Change Working Directory (CD) subcommand. How you specify a set of remote files depends on the system. Most systems allow a generic asterisk, `*`. If the remote system is an iSeries, for example:
`DIR MYLIB/MYFILE.*` produces a list of all members of MYFILE in library MYLIB.

There are two possible file name formats you can use. The example shown here uses NAMEFMT 0. For information about FTP file naming, see NAMEFMT (Select File Naming Format).

(Disk
Stores the results of the DIR subcommand in the file `*CURLIB/DIROUTPUT.DIROUTPUT`, instead of showing the results on the display.

If the remote system is an iSeries, the information includes:
- For database files, the *FILE objects, and members.
- For hierarchical file system (HFS) files:
  - All document library services (QDLS) folders and their contents, which could be other folders or documents.
  - All optical volumes (QOPT) and their contents, which could be directories or files.

Use the DIR subcommand with caution. If you enter the DIR subcommand without any parameters, the server produces a listing of all the current directory files. This may be a much longer list than you want.

To get a list of the file names in a directory, use the List (LS) subcommand (see LS (List Remote File Names)).

Go To:
- FTP client subcommands
- FTP client syntax conventions

EBCDIC (Change File Type to EBCDIC)
FTP Client Subcommand

EBcdic

The EBCDIC transfer type is useful when transferring files to or from another EBCDIC system. This is due to the fact that it avoids the need to convert between ASCII and EBCDIC on both systems.

Go To:
- FTP client subcommands
- FTP client syntax conventions

GET (Copy a File from a Remote System to the Local System)
FTP Client Subcommand

Get *remotefile* [*localfile*]
[(Replace]

remotefile
The file that you want to retrieve from the remote system.

localfile
The local file member, document, or other file you want to create. If you do not specify a local file name, the FTP client provides a default name. For information about the default names, see Default file names for client transfer subcommands.

(Replace
Writes over the localfile if it already exists. The server will not overwrite the localfile unless you specify (Replace.

The file system in which the file resides determines which file name format you use with the GET subcommand.

- If the file does not reside in the library file system (QSYS.LIB), you must use the GET subcommand in name format (NAMEFMT) 1:

```
GET /QDLS/QIWSOS2/PCSMENU.EXE
```

- If the file resides in the library file system, use the GET subcommand and the name format (NAMEFMT) set to 0:

```
GET YOURLIB/YOURFILE.YOURMBR (REPLACE
```

  Assuming the remote server is an iSeries, this command gets the YOURMBR of YOURFILE in YOURLIB and places it in YOURMBR of YOURFILE in your current directory on your local system. For more information on defining the current directory, see LCD (Change Working Library or Directory on Local System).

Note: If the remote file name requires apostrophes as part of the file name, then enclose the file name within two more sets of apostrophes. The following example gets `’MEMBER.ONE’` from the remote host. See Enclosing subcommand parameters for more information.

```
GET LIBRARY/FILE.MEMBER 'MEMBER.ONE'
```

Go To:

- FTP client subcommands
- FTP client syntax conventions
- MGET (Copy Multiple Files from a Remote System to the Local System)
- PUT (Copy a File Member from the Local System to a File on a Remote System)
- MPUT (Send Multiple File Members from the Local System to a Remote System)

HELP (Getting Help for FTP Subcommands)

The HELP subcommand provides information about the FTP subcommands that the local system and the remote system uses.

Help for FTP Client Subcommands

To get information about FTP subcommands used by the local system, use the HELP subcommand in this format:

Help [* | ALL | *subcommand*]

*** or ALL**
Displays a list of the FTP client subcommands.

subcommand
Provides detailed help for the specified client subcommand. For example, `HELP GET` tells you how to transfer a file from a remote system to your local system. You may abbreviate the subcommand to a meaningful prefix.

If you use the HELP subcommand without a parameter, you see a list of subcommands and a general description of the help information available. Context-sensitive help is available by positioning the cursor over a command on the help display and then pressing the **Enter** key.

To get the list of local subcommands on an iSeries server, enter:

```
HELP
```

Help information can be obtained with the ? subcommand.

Help for FTP Server Subcommands

To obtain help for FTP subcommands on the remote system, use the HELP subcommand in this format:

```
Help SERVER [subcommand]
```

SERVER
Gives the help the remote system offers for FTP server subcommands. This is similar to using QUOTE with the HELP parameter. QUOTE HELP lists the FTP subcommands supported by the remote system.

subcommand
The name of the server subcommand that you want the information. For example, `HELP SERVER STOR` will request the server to provide help on the STOR subcommand.

Note: RHELP is a synonym for HELP SERVER. For example, HELP SERVER SITE and RHELP SITE are equivalent.

For additional information, see QUOTE (Send a Subcommand to an FTP Server).

Go To:

- FTP client subcommands
- FTP client syntax conventions

LCD (Change Working Library or Directory on Local System)

FTP Client Subcommand

```
LCd pathname
```

pathname
The name of a library, folder, or directory on the local system.

Notes:

1. The LCD subcommand does not change the current library entry of the library list.
2. When using the subcommand CD (or LCD) to change from one file system to another file system, you must specify the “root” directory For example, /QDLS or /QOPT.

Go To:

- FTP client subcommands
- FTP client syntax conventions

LOCSITE (Specify Local Site Information)

FTP Client Subcommand

To specify information that is used by the FTP client to provide services specific to the client system, use the LOCSITE FTP client subcommand:

```
LOCSITE [ parameters ]
```

The iSeries FTP client supports these parameters and parameter options for the LOCSITE subcommand:

CRTCCSID *CALC
New database files created during ASCII file transfers use the related default EBCDIC CCSID of the ASCII file transfer CCSID. This is the default value.

CRTCCSID *USER
New database files created during ASCII file transfers use the current job CCSID. However, if this CCSID is 65535, the default CCSID determined by the language id in the current job specification.

CRTCCSID *SYSVAL
New database files created during ASCII file transfers use the CCSID that the QCCSID system value specifies.

CRTCCSID [CCSID-number]
Specify the CCSID you want to use when creating database files on the client during ASCII file transfers. The server validates this value.

CRTCCSID
Display a message that contains the current FTP client CRTCCSID setting.

TRIM 0
Set Trim option to OFF. The server sends trailing blanks of database records.

TRIM 1
Set Trim option to ON. The server does not send trailing blanks of database records when transferring database files that use file structure and stream mode. This is the default.

TRIM 2
Set Trim option so the server does not send trailing blanks of database records for all transfers, including record structure and block mode.

TRIM
Display a message that contains the current setting of the FTP client TRIM option.

Notes:

1. Prior to the availability of this subcommand, trailing blanks of QSYS.LIB file system records were always removed before transferring the file to the server system.
2. TRIM settings do not apply to TYPE I (binary) file transfers. Blanks are never trimmed for TYPE I file transfers, regardless of the TRIM setting.

» **DTAPROT C**
Set the data protection variable to C (Clear). This variable is used to set the data protection level when opening a secure control connection. For more details about setting data protection security, refer to the following subcommands: SECDATA and SECOPEN.

DTAPROT P
Set the data protection variable to P (Private). This variable is used to set the data protection level when opening a secure control connection.

DTAPROT

Display a message that contains the current value of the the data protection variable. «

Go To:

- FTP client subcommands
- FTP client syntax conventions

LOCSTAT (Display Local Status Information)
FTP Client Subcommand

```
LOCSTat
```

Displays Local status information, including:

- The current setting of the SENDSITE subcommand
- The current setting of the SENDPORT subcommand
- Remote system name, port number, and logon status
- Data type and transfer mode
- Name format value for both the client and the server
- Setting for the VERBOSE mode
- Setting for the DEBUG mode

Go To:

- FTP client subcommands
- FTP client syntax conventions

LS (List Remote File Names)
FTP Client Subcommand

```
LS [name] [(Disk]
```

name
The remote directory, file, or library that you want to list. If the remote system is an iSeries server, the

server lists the file names and its members. The default is to list the entire current directory, library, or folder. To change the current directory, library, or folder, use the CD subcommand (see CD (Change Working Directory or Library)). The remote file specification is system dependent.

(Disk
Stores the results of the LS subcommand in the file `*CURLIB/LSOUTPUT.LSOUTPUT`, instead of showing the results on the display. Each time you specify the (Disk parameter with the same *CURLIB, the server changes the contents of the LSOUTPUT.LSOUTPUT member file.

Note: If the FTP server returns a negative reply code (550), then there will be no LSOUTPUT member. If the FTP server returns a positive reply code (150) without any file names, then an LSOUTPUT member with no records will result.

The LS subcommand lists the file names only. To get a list of complete directory entries with additional information about the files see DIR (List Directory Entries, Libraries, or Files).

Go To:

- FTP client subcommands
- FTP client syntax conventions

LTYPE (Local Type)

FTP Client Subcommand

To specify the file transfer type or the representation in which the transfer is to take place on the local system, use the LTYPE FTP client subcommand in this format:

```
LType C ccsid#
```

C
The CCSID type. Code this value as C.

ccsid#
The CCSID value. Code this value as a CCSID number 1-65533.

Note: The LTYPE subcommand is similar to the TYPE subcommand (see TYPE (Specify File Transfer Type)). The LTYPE subcommand changes only the representation type on the client side. The TYPE subcommand changes the representation type on both the client and the server.

Go To:

- FTP client subcommands
- FTP client syntax conventions

MDELETE (Delete Multiple Files on a Remote System)

FTP Client Subcommand

```
MDelete {remotefile [remotefile...]}
```

remotefile
The file or files on the server system you want to delete.

Note: When the remotefile is an iSeries QSYS.LIB file, then the server deletes all members of the iSeries physical file. The file itself remains.

This is a library file system example in NAMEFMT 0:

```
MDELETE MYLIB/FILE1.MBRA YOURLIB/FILE2.MBRB
```

This deletes member MBRA in file FILE1 in library MYLIB and member MBRB in file FILE2 in library YOURLIB on a remote iSeries server. The same example in NAMEFMT 1:

```
MDELETE /QSYS.LIB/MYLIB.LIB/FILE1.FILE/MBRA.MBR
/QSYS.LIB/YOURLIB.LIB/FILE2.FILE./MBRB.MBR
```

This is a document library system example in NAMEFMT 1:

```
MDELETE /QDLS/QIWSOS2/PCSMENU.EXE /QDLS/PCSDIR/PCSFILE.EXE
```

This deletes document PCSMENU.EXE in folder QIWSOS2 in the document library services library, and also deletes PCSFILE.EXE in folder PCSDIR in the QDLS library on an iSeries.

You can use an asterisk (*) to delete the files generically. For example with NAMEFMT 0, if the remote system is an iSeries, type:

```
MDELETE MYLIB/MYFILE.*
```

This example would delete all members of file MYFILE in library MYLIB. Use of the asterisk is only valid at the end of a character string.

Go To:

- FTP client subcommands
- FTP client syntax conventions

MGET (Copy Multiple Files from a Remote System to the Local System)
FTP Client Subcommand

How MGET transfers files:

To copy one or more remote files, use the MGET FTP client subcommand in this format. A separate GET subcommand is executed for each remote file you want transferred. The server creates the name of the corresponding local file automatically as determined by the Default Naming rules.

The MGET FTP client subcommand uses the following process to determine where to put files.

- The MGET subcommand always places files in the current library or directory.
- If the user has issued the LCD subcommand, the server uses this library or directory.
- If the user has not issued the LCD subcommand, the server sets the current directory as follows
  - If the user's job has a current library set, this library is the current directory for FTP.
  - If the user's job does not have a current library set, the server uses QGPL as the current directory.

MGet {*remotefile*
[remotefile...]}[(Replace]

remotefile
The file or files you want to retrieve from the remote system.

(Replace

Overwrites an existing file on your local system. If the file already exists on your local system and you do not use the Replace option, the existing file is not overwritten. The name of the local file where the remotefile is copied is created automatically. See the GET subcommand description GET (Copy a File from a Remote System to the Local System) for additional information.

You can use an asterisk (`*`) to copy all members in a file to your current library or directory. For example, if the remote system is an iSeries,

- `MGET MYLIB/MYFILE.*` copies all the members of file MYFILE in library MYLIB on the remote system to your current library on the local system.
- `MGET /QSYS.LIB/MYLIB.LIB/MYFILE.FILE/*.MBR` would be the NAMEFMT 1 version of this command.
- `MGET /QOPT/PICTURES/IMAGES/.*` copies all the files of directory IMAGES from optical volume PICTURES to your current library (or directory) on the local system.
- `MGET TESTFILE.A*` copies all members that start with the letter A in file TESTFILE.
- `MGET /QDLS/QISSOS2/A*` copies all documents that start with the letter A in folder QISSOS2.

Go To:

- FTP client subcommands
- FTP client syntax conventions

MKDIR (Make Directory)

FTP Client Subcommand

```
MKdir pathname
```

pathname

The name of a file directory, library, or other system-dependent file-group designator on the remote system.

Go To:

- FTP client subcommands
- FTP client syntax conventions

MODE (Specify Transmission Mode of Data)

FTP Client Subcommand

```
MODE [ B | S]
```

B

Specifies block mode. In this mode, the server transmits data as a series of data blocks, preceded by one or more header bytes. If you are transferring data in block mode, the type must be EBCDIC.

S

Specifies stream mode. In this mode, the server transmits data as a stream of bytes. You can use any representation type with stream mode.

Notes:

1. Stream mode is the default transfer mode that is used in FTP. Some systems do not support block mode.
2. If you omit the optional parameter, the client displays the present MODE value.

Go To:

- FTP client subcommands
- FTP client syntax conventions

MPUT (Send Multiple File Members from the Local System to a Remote System)

FTP Client Subcommand

To send one or more local files to the remote system, use the MPUT FTP client subcommand. The client executes a separate PUT subcommand for each local file you want transferred. The Default Naming rules create the name of the corresponding remote file.

MPut {*localfile* [localfile...]}

localfile
Specify one or more local library file system file members or other FTP supported file system files you want transferred to the remote system. The client automatically generates the name given to the file on the remote system.

Note: If the remote file already exists, the contents are replaced by the contents of *localfile* unless Store Unique (SUNIQUE) is on (see SUNIQUE (Control Overwriting of Files)).

For information as to how to specify the file if the remote system is an iSeries, see NAMEFMT (Select File Naming Format). This example uses NAMEFMT 0:

```
MPUT MYLIB/FILE1.MBR1 MYLIB/FILE1.MBR2
```

This sends members MBR1 and MBR2 of file FILE1 in library MYLIB to the remote system.

This example uses NAMEFMT 1:

```
MPUT /QDLS/QIWSOS2/PCSMENU.EXE /QDLS/QIWSOS2/PCSMENU2.EXE
```

This sends document PCSMENU.EXE and document PCSMENU2.EXE from folder QIWSOS2 to the remote system.

You can use an asterisk (*) to send all the members in a file. For example, `MPUT MYLIB/MYFILE.*` transfers all the members of file MYFILE in library MYLIB. For additional information, see MGET (Copy Multiple Files from a Remote System to the Local System).

Go To:

- FTP client subcommands
- FTP client syntax conventions
- PUT (Copy a File Member from the Local System to a File on a Remote System)

NAMEFMT (Select File Naming Format)

FTP Client Subcommand

To select which file name format to use on the local system and the remote system (if it is an iSeries), use the NAMEFMT FTP client subcommand:

NAmefmt [0 | 1]

0
A name format only for library file system database files. The general format is:

```
[libname/]filename[.mbrname]
```

1
A name format for all file systems that FTP supports, including the library file system. You must set the name format to ’1’ to work with all iSeries file systems.

Library file system files in this name format are:

```
[/QSYS.LIB/][libname.LIB/]filename.FILE[/mbrname.MBR]
```

For save files, you can also use the format:

```
/QSYS.LIB/libname.LIB/filename.SAVF
```

Files in the document library services file system are in this format:

```
[/QDLS/][{foldername[.ext]/}]filename[.ext]
```

For optical, the format is:

```
/QOPT/volname/dirname/filename.ext
```

Notes:

1. You can set the name format to 0 only when the working directory is a database library.
2. If you specify the NAMEFMT subcommand without a parameter, the client displays the current name format.

You may also want to refer to:

- File systems and naming conventions FTP supports
- FTP client subcommands
- FTP client syntax conventions

NULLFLDS (Allow Transfer of Files with NULL Fields)

FTP Client Subcommand

Use this command to select whether or not to allow transfer of a database files that contain NULL field values on the local system, and the remote system if it is an iSeries.

```
NUllflds [ 0 | 1 ]
```

When you enter a parameter the valid values are:

0
Do not allow transfer of database files that contain NULL fields. This is the default.

1
Allow transfer of database files that contain NULL fields.

Notes:

1. Transfer of files that contain NULL fields requires both the client and server to have this setting enabled. The target file must exist prior to the file transfer. Also, the target file must have the same file definition as the source file.
2. Results are not predictable if you transfer a file that contains NULL fields a server that is not an iSeries, or if the transfer type results in codepage conversion of the data.
3. If you specify the NULLFLDS subcommand without a parameter, the client displays the current setting.

Go To:

- FTP client subcommands
- FTP client syntax conventions

OPEN (Connect to FTP Server on a Remote System)

FTP Client Subcommand

Open *systemname* [*portnumber*]

systemname
The name or Internet address of the remote system.

portnumber
The port number to use for this session until the server closes the connection. This is optional. If you do not specify a port number, the server chooses one.

Once you have opened a connection to a remote system, you cannot connect to another system until you close the current session.

Go To:

- FTP client subcommands
- FTP client syntax conventions

PASS (Send Your Password)

FTP Client Subcommand

PAss *password*

password
A string that specifies your password.

the OPEN and USER subcommands must precede this subcommand. For some systems, this completes your identification for access control. This subcommand is not necessary when the server requests you to type a password when connecting or logging on to the server.

Go To:

- FTP client subcommands
- FTP client syntax conventions

PUT (Copy a File Member from the Local System to a File on a Remote System)
FTP Client Subcommand

PUt *localfile* [*remotefile*]

localfile
The name of a local library system file member, save file, document, or other file.

remotefile
The name of the delivered file on the remote system. If you do not specify the remote file name, the FTP server provides a default name. For information about default names, see Default file names for client transfer subcommands. If a remote file with the same name already exists, then the server replaces the contents with the contents of the local file unless Store Unique (SUNIQUE) is on (see SUNIQUE (Control Overwriting of Files)).

To send a file to the remote system, you must have a defined current working directory with write privileges.

This example uses the PUT subcommand to transfer a file member:

```
PUT MYLIB/MYFILE.MYMBR (NAMEFMT = 0)
```

This sends member MYMBR of file MYFILE in library MYLIB to the remote system.

This example sends the document PCSMENU.EXE of folder QIWSOS2 in the document library services file system to the remote system.

```
PUT /QDLS/QIWSOS2/PCSMENU.EXE (NAMEFMT = 1)
```

Note: If the remote file name requires apostrophes as part of the file name, then you must enclose the file name within two more sets of apostrophes. The following example sends ’MEMBER.ONE’ as the file name to the remote host. See Enclosing subcommand parameters for more information.

```
PUT LIBRARY/FILE.MEMBER 'MEMBER.ONE'
```

Go To:

- FTP client subcommands
- FTP client syntax conventions
- MPUT (Send Multiple File Members from the Local System to a Remote System)
- GET (Copy a File from a Remote System to the Local System)
- MGET (Copy Multiple Files from a Remote System to the Local System)

PWD (Display Current Directory, Folder, or Library)
FTP Client Subcommand

To display the current directory or library of the remote system, use the PWD FTP client subcommand:

PWd

If the remote server is an iSeries, the server displays your current library or file system directory on the remote system. Also, the server displays the working directory in quotation marks. To change the current library or directory of the remote system, use the Change Working Directory (CD) subcommand.

Go To:

- FTP client subcommands
- FTP client syntax conventions

QUOTE (Send a Subcommand to an FTP Server)

FTP Client Subcommand

```
QUOte string
```

string
The server subcommand you want sent to and interpreted by the remote FTP server. The FTP server sends the string verbatim to the remote FTP server.

Notes:

1. The client requires the QUOTE subcommand to run the special iSeries FTP server subcommand RCMD (Send a CL Command to an FTP Server System). For example, to write the server job log to a spooled file, enter this:

   ```
    QUOTE RCMD DSPJOBLOG
   ```

   You can use WRKSPLF to access the job log. Note that you will need to specify the user profile of the user who logged in to the FTP server if the WRKSPLF is run from a different user profile.
2. iSeries FTP server limits the string to 1000 characters.
3. For the QUOTE subcommand, whatever you enter passes on to the server. For example, if you enter:

   ```
   QUOTE CWD 'SYS1'
   ```

   The server receives

   ```
   CWD 'SYS1'
   ```

You can get help information from the server by typing this:

```
QUOTE HELP
```

The server sends the HELP subcommand to the remote host, which returns a display of all subcommands it supports. The information displayed varies depending on the type of remote host.

It should be noted that server subcommands entered with the QUOTE subcommand only affect the server, but similar client subcommands may affect both the client and the server. For example, the REIN client subcommand sends the server a REIN server subcommand plus reinitializes certain client state variables. QUOTE REIN sends only REIN to the server, but does not change any client state variables.

Note: Be careful when using the QUOTE subcommand to directly enter server subcommands so that unintended results do not occur. Typically, use the QUOTE subcommand for special situations that cannot use other client subcommands. An example of this is when one wants to use one of the special iSeries server subcommands like CRTL.

Go To:

- FTP client subcommands
- FTP client syntax conventions

REINITIALIZE (Reinitialize Session between Systems)

FTP Client Subcommand

```
REInitialize
```

If the server supports the REINITIALIZE subcommand, the USER session with the server is ended. The server is in the same state as when the connection was established, and the user needs to log on again to continue.

Any file transfers already in progress can complete before the USER session ends.

Go To:

- FTP client subcommands
- FTP client syntax conventions

RENAME (Rename a File on a Remote System)

FTP Client Subcommand

```
REname originalname newname
```

originalname
The present name of the remote file.

newname
The new name of the remote file. If the file specified by *newname* already exists, the new file replaces it.

This example renames the file SPORTSCAR.BMP in directory IMAGES on optical volume PICTURES to CAR.BMP:

```
REN /QOPT/PICTURES/IMAGES/SPORTSCAR.BMP
 /QOPT/PICTURES/IMAGES/CAR.BMP
```

Note: On an iSeries server, you cannot rename a file to a different file system.

Go To:

- FTP client subcommands
- FTP client syntax conventions

RESET (Reset)

FTP Client Subcommand

To clear the server reply queue, use the RESET FTP client subcommand:

```
REset
```

This subcommand resynchronizes the sequencing of the server subcommands and replies with the remote FTP server. Resynchronization may be necessary following a violation of the FTP protocol by the remote server.

Go To:

- FTP client subcommands
- FTP client syntax conventions

RMDIR (Remove Directory)

FTP Client Subcommand

```
RMdir pathname
```

pathname
The name of a file directory, library, or other system-dependent file-group designator on the remote system. For hierarchical file system (HFS) directories, you can only delete empty directories. The server deletes Libraries unconditionally.

Go To:

- FTP client subcommands
- FTP client syntax conventions

SECData (Setting data security protection)

FTP Client Subcommand

To specify the protection level to be used for the data connection when there is a secure control connection already established with the remote system, use the SECData subcommand as follows:

```
SECData [ C | P ]
```

Note: SData is a synonym for this subcommand.

C
Data channel protection level is set to ’clear’. This connection is **not** secure. This might be used for pre-encrypted data or non-sensitive data.

P
The data channel protection level is set to ’private’. This connection is secure. A TLS negotiation between the client and the server must take place before any data is transmitted over the connection.

1. When no parameter is specified, SECData displays the present value used for setting data security protection.
2. The data protection level is initially set to the value specified by the DTAPROT parameter of the STRTCPFTP CL command when a secure control connection is established with an FTP server.
3. A secure control connection is required to use the SECData subcommand.
4. A PROT server subcommand is issued to the server each time the SECDATA subcommand successfully sets the data protection level.
5. The SECData subcommand sends a PBSZ and a PROT subcommand to the server when setting the data protection level. Also, the SECData subcommand sets a client variable for each successful PROT subcommand. This variable represents the last data protection level (C or P) accepted by the server.

This variable is used to set the data protection level when the SECOpen subcommand opens a secure control connection. This variable may be changed using the LOCSITE DTAPROT (See 66) option.

6. The parameters ’C’ and ’P’ for the SECData subcommand are the same as used by the PROT server subcommand.

Go To:

- FTP client subcommands
- FTP client syntax conventions

SECOpen (Setting data security protection)

FTP Client Subcommand

The SECOpen FTP client subcommand opens a secure control connection to an FTP server using the specified security option. The syntax of this subcommand is:

```
SECOpen systemname [portnumber] [ security_option ]
```

Note: SOpen is a synonym for SECOPEN.

systemname
Enter the name or Internet address of the remote system

portnumber
Enter the port number for this connection.

Notes:

- If this parameter is omitted and (SSL is specified, the port number 21 will be used.
- If this parameter is omitted and (IMPLICIT is specified, then port number 990 is used.
- If both the port number and the security_option are omitted, then port number 21 and (SSL are assumed.

security_option
Specify the type of security to be used.

(SSL
Uses a secure SSL connection to the FTP server. The AUTH (Authorization) server subcommand is used when making the connection.

(IMPLICIT
Uses an “implicit” SSL/TLS secure connection to the FTP server. An “implicit” SSL connection is made without sending the AUTH, PBSZ, and PROT sever subcommands to the server. In this case, the server must be configured to expect an SSL/TLS connection negotiation to occur for the specified port number.

For the “implicit” SSL case, the server will act as if the client had sent these subcommands with the parameters shown below:

- AUTH SSL
- PBSZ 0
- PROT P

Note:

If the security_options parameter is not specified, then (SSL will be assumed. When the port number used is 990, then (IMPLICIT is assumed.

Go To:

- FTP client subcommands
- FTP client syntax conventions

SENDPASV (Specify Whether to send a PASV Subcommand)

FTP Client Subcommand

To specify whether or not to send a PASV subcommand to the FTP server when doing a data transfer or issuing the DIR and LS subcommands, enter the SENDPASV FTP client subcommand:

```
SENDPAsv [ 0 | 1 ]
```

If there is no parameter SENDPASV works like a toggle switch. The SENDPASV value toggles from 1 (ON) to 0 (OFF) or from 0 to 1.

When there is a parameter, the valid values are:

0
Do not send a PASV subcommand.

1
Send a PASV subcommand. This is the default.

iSeries default (on) is to send the PASV subcommand. When SENDPASV is off, then the server does not send the PASV subcommand.

Notes:

1. This subcommand supports RFC 1579, “Firewall-Friendly FTP.” Use of the PASV subcommand to establish a data connection is a better method when a data transfer must go through a firewall. In some scenarios, a data transfer through a firewall may not be possible without use of PASV.
2. Some FTP servers may not support the PASV subcommand. When this is the situation and SENDPASV is ON, then the FTP client will display a message that indicates that the server does not support PASV. The system will attempt to establish the data connection without sending the PASV subcommand.
3. When SENDPASV is OFF or disabled, then the server sends the PORT subcommand when SENDPORT is ON. See SENDPORT (Specify Whether to Sends a PORT Subcommand)
4. FTP servers that do not support PASV are not compliant with RFC 1123.

Restriction

When connected to an FTP server through a SOCKS server, the SENDPASV subcommand may only be used before you issue any data transfer subcommand list directory subcommand. If you use SENDPASV after one of these subcommands, then the client will not be able to establish a data connection to the FTP server.

Once the client has issued a data transfer or list directory subcommand, then close the connection to the FTP server through a SOCKS server before you issue SENDPASV again.

You may use the SENDPASV subcommand when the FTP client is disconnected from an FTP server.

Go To:

- FTP client subcommands
- FTP client syntax conventions

SENDPORT (Specify Whether to Sends a PORT Subcommand)

FTP Client Subcommand

To specify whether or not to send a PORT subcommand to the FTP server when doing a data transfer or when issuing the DIR and LS subcommands. Enter the SENDPORT FTP client subcommand:

```
SENDPOrt [ 0 | 1 ]
```

If there is no parameter SENDPORT works like a toggle switch. The SENDPORT value changes from 1 (ON) to 0 (OFF) or from 0 to 1.

When there is a parameter, the valid values are:

0
Do not send a PORT subcommand.

1
Send a PORT subcommand. This is the default.

Notes:

1. Use SENDPORT only when you cannot establish a connection to the server without it. The indiscriminate use of SENDPORT may result in errors.
2. You may find it useful to not send the PORT subcommand to those systems that ignore PORT subcommands because they indicate that they have accepted the command.
3. The server does not send the PORT subcommand when the SENDPASV option is ON. See SENDPASV (Specify Whether to send a PASV Subcommand).

Go To:

- FTP client subcommands
- FTP client syntax conventions

SENDSITE (Specify Whether to Send a SITE Subcommand)

FTP Client Subcommand

To specify whether or not a SITE subcommand with record format information is automatically sent when doing a PUT or an MPUT operation, enter the SENDSITE FTP client subcommand in this format:

```
SENDSite [ 0 | 1 ]
```

If there is no parameter, SENDSITE works like a toggle switch. The SENDSITE value changes from 0 (OFF) to 1 (ON) or from 1 to 0.

When there is a parameter, the valid values are:

0
Do not send a SITE subcommand. This is the default.

1
Send a SITE subcommand (containing record format information) prior to sending PUT and MPUT subcommands. Use this setting when transferring files to an IBM Virtual Machine server that uses the record format information that sends with the SITE subcommand.

Go To:

- FTP client subcommands
- FTP client syntax conventions

SITE (Send Information Used by a Remote System)
FTP Client Subcommand

To send information that is used by the remote system to provide services specific to the remote system, use the SITE FTP client subcommand in this format:

```
SIte [parameters]
```

parameters
Dependent on the remote system.

To find the nature of these parameters and their syntax specifications, issue the HELP SERVER SITE subcommand. Some FTP servers do not support the SITE subcommand.

Note: The SITE subcommand is used by the PUT and MPUT subcommands to indicate the format and length of the records. By default, the PUT subcommand sends a SITE subcommand automatically. The NAMEFMT subcommand uses the SITE subcommand to indicate to the server whether names are in NAMEFMT 0 or NAMEFMT 1.

For more information, see SENDSITE (Specify Whether to Send a SITE Subcommand).

Go To:

- FTP client subcommands
- FTP client syntax conventions

STATUS (Retrieve Status Information from a Remote System)
FTP Client Subcommand

```
STAtus [name]
```

name
The name of the remote directory or file for which you request the status information. It is not a required parameter.

Note: The iSeries FTP server application does not support this name parameter.

If there is no parameter, the server returns general status information about the FTP server process. This includes current values of all transfer parameters and the status of connections. The status information that is returned depends on the specific server implementation.

Go To:

- FTP client subcommands
- FTP client syntax conventions

STRUCT (Specify File Structure)
FTP Client Subcommand

To specify the structure of the data sent for a file, use the STRUCT FTP client subcommand in this format:

```
STRuct [F | R]
```

F A file structure. The structure of a file is a continuous sequence of data bytes.

R A record structure. The file transfers as a sequence of sequential records.

The structure of a file affects the transfer mode and the interpretation and storage of a file.

Go To:

- FTP client subcommands
- FTP client syntax conventions

SUNIQUE (Control Overwriting of Files)
FTP Client Subcommand

To control whether a file is overwritten when doing a PUT or MPUT subcommand, enter the SUNIQUE FTP client subcommand:

```
SUnique [ 0 | 1 ]
```

If there is no parameter, SUNIQUE acts like a toggle switch. The SUNIQUE value changes from 0 (OFF) to 1 (ON) or from 1 to 0.

When there is a parameter, the valid values are:

0
Overwrite the file if it exists. This is the default.

1
Create a new file with a unique name on the remote system instead of overwriting an existing file. The FTP server on the remote system sends the name of the created file back to the user.

Note: If the remote system is an iSeries, the server forms File.Mbr names by adding numbers to the end of the of the *localfile* that you specified in the PUT or MPUT subcommand. Thus, if the name *NEWFILE.NEWMBR* already exists on the remote system, the remote iSeries server creates *NEWFILE.NEWMBR1* and writes the data to it.

File names for other file systems, like HFS, work in a similar way. If the name already exists, a new file is created that consists of the specified file name and a number suffix. Thus, if the name *xfsname* already exists on the remote system, the remote iSeries creates *xfsname1*.

Go To:

- FTP client subcommands
- FTP client syntax conventions

SYSCMD (Pass an iSeries CL Command to Your Local iSeries)

FTP Client Subcommand

To run a control language (CL) command on your local iSeries without leaving the FTP environment, use the SYSCMD FTP client subcommand in this format:

```
SYSCmd commandline
```

commandline
An iSeries CL command. You can precede the command name with a ? to get the prompt for the CL command. For example, if you enter:

```
SYSCMD ? SNDBRKMSG
```

you get the display for the Send Break Message (SNDBRKMSG) command.

If you want to see low level messages that result from your CL command, or if you want to enter multiple CL commands before returning to the FTP environment, use the iSeries CALL QCMD command.

For example, to get to an iSeries Command Entry display, enter this:

```
SYSCMD CALL QCMD
```

From the Command Entry display you can then call your application programs or enter CL commands. At the completion of your application program or the CL command, you return to the Command Entry display. From there you can display messages, start additional work on the system, or press F3 (Exit) or F12 (Cancel) to return to FTP.

You can enter iSeries CL commands when you press F21 (CL command line) from the main FTP display. The server does not allow the F21 key when an exit program it is an addition to the FTP Client Request Validation exit point.

Notes:

1. Most server systems have a time-out period that ends the session if no activity occurs within a specific time period. If the command runs for longer than the time-out period, the server ends the connection with the client.
2. The iSeries server supports the exclamation mark (!) as a synonym for the SYSCMD subcommand.
3. The SYSCMD subcommand passes to the iSeries as a CL command exactly what the user enters.

Go To:

- FTP client subcommands
- FTP client syntax conventions

TYPE (Specify File Transfer Type)
FTP Client Subcommand

To specify the file-transfer type, or the representation in which the transfer is to take place, use the TYPE FTP client subcommand in this format:

```
TYpe [ A
   | B [ 1 | 2 | 3 [A|R] | 4 [A|R] | 5 | 6 | 7]
   | C ccsid#
   | E
   | F [ 1 ]
   | I ]
```

A
Specifies the transfer type as the default (ASCII) transfer type. This has the same effect as the ASCII subcommand. The server does not associate any vertical format control with the file. It only supports the default format NON PRINT for ASCII. Use the ASCII transfer type or the transfer of text files, except when both systems use the EBCDIC type.

The default CCSID for TYPE A (ASCII) is the CCSID that is specified on the CCSID parameter of the STRTCPFTP command or FTP subcommand.

B
Shift JIS Kanji (CCSID 932)

B 1
Shift JIS Kanji (CCSID 932)

B 2
Extended UNIX Code Kanji (CCSID 5050)

B 3
JIS 1983 using ASCII shift-in escape sequence (CCSID 5054)

B 3 A
JIS 1983 using ASCII shift-in escape sequence (CCSID 5054)

B 3 R
JIS 1983 using JISROMAN shift-in escape sequence (CCSID 5052)

B 4
JIS 1978 using ASCII shift-in escape sequence (CCSID 5055)

B 4 A
JIS 1978 using ASCII shift-in escape sequence (CCSID 5055)

B 4 R
JIS 1978 using JISROMAN shift-in escape sequence (CCSID 5053)

B 5
Hangeul (CCSID 934)

B 6
Korean Standard Code KSC-5601, 1989 version (CCSID 949)

B 7
Traditional Chinese (5550) (CCSID 938)

C ccsid#
Specifies the transfer type to any CCSID (coded character set identifier) that is installed on the system. The CCSID number must follow C.

E
Specifies the transfer type as EBCDIC. This has the same effect as the EBCDIC subcommand. The server does not associate any vertical format control with the file. It only supports the default format NON PRINT for EBCDIC. Use the EBCDIC transfer type for the efficient transfer between systems that use EBCDIC as their internal character representation.

F
IBM EBCDIC Kanji (CCSID 5035)

F 1
IBM EBCDIC Kanji (CCSID 5035)

I
Specifies the transfer type as image. This has the same effect as the BINARY subcommand. With the image transfer type, data is a string of bits, packed into 8-bit bytes. The image transfer type is an efficient at storing and retrieving files and for transferring binary data such as object code. Data is transferred as is; there is no conversion.

If there are no parameters, the server displays the present setting for the TYPE subcommand.

Go To:

- FTP client subcommands
- FTP client syntax conventions

USER (Send Your User ID to the Remote System)

FTP Client Subcommand

User *userid* [*password*]

userid
Your logon name on the remote system.

password
Your password on the remote system. Specifying your password is optional. If you do not supply your password when calling the USER subcommand, you receive a prompt to do so if the remote system requires a logon password.

Go To:

- FTP client subcommands
- FTP client syntax conventions

VERBOSE (Control of Text Display of Error Reply Messages) FTP Client Subcommand

To control the display of FTP server replies, use the VERBOSE FTP client subcommand. The VERBOSE subcommand toggles the verbose switch on and off. When verbose is on, all server replies, including their reply codes, are displayed. When set to off, certain server replies and reply codes are discarded and not displayed.

```
Verbose
```

Go To:

- FTP client subcommands
- FTP client syntax conventions

FTP exit programs

» The FTP client and the FTP server communicate with each exit program through a specific exit point. Parameters are passed between the server and the exit program. The format of the exchanged information is specified by an exit point format.

FTP uses the following exit points. Refer to these topics for more information, including parameter descriptions and code examples:

- Request validation exit point: client and server
- Server logon exit point

To allow the exit programs to work properly, you must Install and register your exit point programs. If your programs are no longer needed, you must properly Remove the exit point programs to prevent their future functioning.

TCP/IP exit points and exit point formats

The following table provides information about exit points for various TCP/IP applications and their related exit point formats.

TCP/IP Exit Points	Application	VLRQ0100	TCPL0100	TCPL0200	TCPL0300
QIBM_QTMF_CLIENT_REQ	FTP	X			
QIBM_QTMF_SERVER_REQ	FTP	X			
QIBM_QTMF_SVR_LOGON[1]	FTP		X	X	X[2]
QIBM_QTMX_SERVER_REQ	REXEC	X			
QIBM_QTMX_SVR_LOGON[1]	REXEC		X		X[2]
QIBM_QTOD_SERVER_REQ	TFTP	X			

[1] -An exit point may have more than one format, but an exit program can only be registered for one of the exit point formats. Examine each of these formats, then choose the one most appropriate for your system.

[2] - This format is available starting with V5R1.

«

Request validation exit point: client and server

The Request Validation exit points can be used to restrict operations which can be performed by FTP users. Request validation exit points are provided by both the FTP client and server; to restrict both FTP client and FTP server access, exit programs must be added to both exit points.

Note: Since both the FTP client and server exit points share the same exit point format, you can write a single program to handle both.

If you implement anonymous FTP, write your FTP Server Request Validation exit program to restrict anonymous FTP users to retrieve subcommands only, and never allow anonymous users to execute CL commands.

What your program should include:

- Exception handling
- Debugging
- Logging

Allowed and rejected commands

The FTP request validation exit program gives you control over whether to accept or reject an operation. Decisions made by exit programs are in addition to any validation that is performed by the FTP client or FTP server application. The FTP client or server application calls the exit program registered for that application each time it processes one of these requests:

1. Directory/library creation
2. Directory/library deletion
3. Setting current directory
4. Listing file names
5. File deletion
6. Sending a file
7. Receiving a file
8. Renaming a file
9. Execute a CL command

You may want to set value -1 of parameter 8 (Allow operation) in the VRLQ0100 exit point format to always and unconditionally reject a command.

Is there an exit program time-out feature?

There is no time-out for FTP exit programs. If the exit program has an error or exception that it cannot handle, the FTP server will abort the session.

Example programs

Example programs are available to help you set up anonymous FTP on your server. These examples are for illustration purposes. They do not contain enough features to run on a production machine as is. You can use these samples as a starting point to build your own programs. By copying portions of the code from the samples, you can add them to programs that you write yourself. It is recommended that you run the sample programs on a system other than your production system.

Example: FTP Client or Server Request Validation exit program in CL code
Example: FTP Server Request Validation exit program in ILE RPG code

Code example disclaimer

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Example: FTP Client or Server Request Validation exit program in CL code: This is an example of a simple FTP Request Validation exit program. It is written in iSeries Command Language (CL). This code is not complete, but provides a starting point to help you create your own program for the client or server exit point.

Note: Read the Code example disclaimer for important legal information.

(Pre formatted text in the following example will flow outside the frame.)

```
/******************************************************************************/
/*                                                                            */
/*    Sample FTP server request validation exit program for anonymous FTP.    */
/*    Note:  This program is a sample only and has NOT undergone any formal   */
/*           review or testing.                                               */
/*                                                                            */
/*  Additional notes:                                                         */
/*  1. When the application ID is 1 (FTP server) AND the operation ID is      */
/*     0 (session initialization), the job is running under the QTCP          */
/*     user profile when the exit program is called.  In ALL other cases,     */
/*     the job is running under the user's profile.                           */
/*  2. It is highly recommended that the exit program be created in a library */
/*     with *PUBLIC authority set to *EXCLUDE, and the exit program itself    */
/*     be given a *PUBLIC authority of *EXCLUDE.  The FTP server adopts       */
/*     authority necessary to call the exit program.                          */
/*  3. It is possible to use the same exit program for both the FTP client    */
/*     and server request validation exit points.  However, this program      */
/*     does not take the client case into account.                            */
/*                                                                            */
/******************************************************************************/

 TSTREQCL:   PGM        PARM(&APPIDIN &OPIDIN &USRPRF &IPADDRIN +
                          &IPLENIN &OPINFOIN &OPLENIN &ALLOWOP)

/* Declare input parameters */
             DCL        VAR(&APPIDIN)   TYPE(*CHAR) LEN(4)  /* Application ID                     */
             DCL        VAR(&OPIDIN)    TYPE(*CHAR) LEN(4)  /* Operation ID                       */
             DCL        VAR(&USRPRF)    TYPE(*CHAR) LEN(10) /* User profile                       */
             DCL        VAR(&IPADDRIN)  TYPE(*CHAR)         /* Remote IP address                  */
             DCL        VAR(&IPLENIN)   TYPE(*CHAR) LEN(4)  /* Length of IP address               */
             DCL        VAR(&OPLENIN)   TYPE(*CHAR) LEN(4)  /* Length of operation-specific info. */
             DCL        VAR(&OPINFOIN)  TYPE(*CHAR) +
                                                  LEN(9999) /* Operation-specific information     */
             DCL        VAR(&ALLOWOP)   TYPE(*CHAR) LEN(4)  /* allow (output) */
```

```
/* Declare local copies of parameters (in format usable by CL) */
             DCL        VAR(&APPID)     TYPE(*DEC)  LEN(1 0)
             DCL        VAR(&OPID) TYPE(*DEC) LEN(1 0)
             DCL        VAR(&IPLEN) TYPE(*DEC) LEN(5 0)
             DCL        VAR(&IPADDR) TYPE(*CHAR)
             DCL        VAR(&OPLEN) TYPE(*DEC) LEN(5 0)
             DCL        VAR(&OPINFO) TYPE(*CHAR) LEN(9999)
             DCL        VAR(&PATHNAME) TYPE(*CHAR) LEN(9999) /* Uppercased path name               */

/* Declare values for allow(1) and noallow(0) */
             DCL        VAR(&ALLOW) TYPE(*DEC) LEN(1 0) VALUE(1)
             DCL        VAR(&NOALLOW) TYPE(*DEC) LEN(1 0) VALUE(0)

/* Declare request control block for QLGCNVCS (convert case) API: */
/* convert to uppercase based on job CCSID  */
             DCL        VAR(&CASEREQ) TYPE(*CHAR) LEN(22) +
                          VALUE(X'00000001000000000000000000000000000+
                          000000000')
             DCL        VAR(&ERROR) TYPE(*CHAR) LEN(4) +
                          VALUE(X'00000000')

/* Assign input parameters to local copies */
             CHGVAR     VAR(&APPID) VALUE(%BINARY(&APPIDIN))
             CHGVAR     VAR(&OPID) VALUE(%BINARY(&OPIDIN))
             CHGVAR     VAR(&IPLEN) VALUE(%BINARY(&IPLENIN))
             CHGVAR     VAR(&IPADDR) VALUE(%SUBSTRING(&IPADDRIN 1 &IPLEN))
             CHGVAR     VAR(&OPLEN) VALUE(%BINARY(&OPLENIN))

/* Handle operation specific info field (which is variable length)  */
             IF         COND(&OPLEN = 0) THEN(CHGVAR VAR(&OPINFO) +
                          VALUE(' '))
             ELSE       CMD(CHGVAR VAR(&OPINFO) VALUE(%SST(&OPINFOIN +
                          1 &OPLEN)))

/* Operation id 0 (incoming connection): reject if connection is coming        */
/* through interface 9.8.7.6, accept otherwise.  (The address is just an       */
/* example.)  This capability could be used to only allow incoming connections */
/* from an internal network and reject them from the "real" Internet, if       */
/* the connection to the Internet were through a separate IP interface.        */
/* NOTE: For FTP server, operation 0 is ALWAYS under QTCP profile.             */
             IF         COND(&OPID = 0) THEN(DO)
               IF       COND(&OPINFO = '9.8.7.6') THEN(CHGVAR +
                          VAR(%BINARY(&ALLOWOP)) VALUE(&NOALLOW))
               ELSE     CMD(CHGVAR VAR(%BINARY(&ALLOWOP)) +
                          VALUE(&ALLOW))
               GOTO     CMDLBL(END)
             ENDDO

/* Check for ANONYMOUS user */
             IF         COND(&USRPRF = 'ANONYMOUS ') THEN(DO)
/* Don't allow the following operations for ANONYMOUS user:                   */
/*   1 (Directory/library creation); 2 (Directory/library deletion);          */
/*   5 (File deletion); 7 (Receive file); 8 (Rename file); 9 (Execute CL cmd) */
               IF       COND(&OPID = 1 | &OPID = 2 | +
                          &OPID = 5 | &OPID = 7 | &OPID = 8 | +
                          &OPID = 9) THEN(CHGVAR +
                          VAR(%BINARY(&ALLOWOP)) VALUE(&NOALLOW))
               ELSE     CMD(DO)
/* For operations 3 (change directory), 4 (list directory) and 6 (send file), */
/* only allow if in PUBLIC library OR "/public" directory.  Note that all     */
/* path names use the Integrated File System naming format.                   */
                 IF     COND(&OPID = 3 | &OPID = 4 | &OPID = 6) THEN(DO)
/* First, convert path name to uppercase (since names in "root" and library   */
/* file systems are not case sensitive).                                      */
                   CALL PGM(QLGCNVCS) PARM(&CASEREQ &OPINFO &PATHNAME +
                                           &OPLENIN &ERROR)
/* Note: must check for "/public" directory by itself and path names starting */
/* with "/public/".                                                         */
                   IF   COND((%SUBSTRING(&PATHNAME 1 20) *NE +
                          '/QSYS.LIB/PUBLIC.LIB') *AND +
                          (&PATHNAME *NE '/PUBLIC') *AND +
                          (%SUBSTRING(&PATHNAME 1 8) *NE '/PUBLIC/')) +
                          THEN(CHGVAR +
                          VAR(%BINARY(&ALLOWOP)) VALUE(&NOALLOW))
                   ELSE CMD(CHGVAR VAR(%BINARY(&ALLOWOP)) +
                          VALUE(&ALLOW))
                 ENDDO
               ENDDO
             ENDDO
/* Not ANONYMOUS user:  allow everything  */
             ELSE       CMD(CHGVAR VAR(%BINARY(&ALLOWOP)) +
                          VALUE(&ALLOW))

 END:        ENDPGM
```

Example: FTP Server Request Validation exit program in ILE RPG code: This is an example of a simple FTP Server Request Validation exit program. It is written in ILE RPG programming language. This code is not complete, but provides a starting point to help you create your own program.

Note: Read the Code example disclaimer for important legal information.

(Pre formatted text in the following example will flow outside the frame.)

```
 * Module Description ***********************************************
 *                                                                  *
 *                      PROGRAM FUNCTION                            *
 *                                                                  *
 * This program demonstrates some of the abilities an FTP Client    *
 * and Server Request Validation Exit Program can have.             *
 *                                                                  *
 * Note:  This program is a sample only and has NOT undergone any   *
 *        formal review or testing.                                 *
 *                                                                  *
 ********************************************************************
F/SPACE 3
 ********************************************************************
 *                                                                  *
 *                       INDICATOR USAGE                            *
 *                                                                  *
 *   IND.  DESCRIPTION                                              *
 *                                                                  *
 *    LR - CLOSE FILES ON EXIT                                      *
 *                                                                  *
 ********************************************************************
F/EJECT
 ********************************************************************
 * DATA STRUCTURES USED BY THIS PROGRAM                             *
 ********************************************************************
 *
 * Define constants
 *
D Anonym          C                   CONST('ANONYMOUS ')
D PublicLib       C                   CONST('/QSYS.LIB/ITSOIC400.LIB')
D PublicDir       C                   CONST('//ITSOIC.400')
 *
 * Some CL commands to used later on in the program
 *
D ClearSavf       C                   CONST('CLRSAVF ITSOIC400/TURVIS')
D SaveLib         C                   CONST('SAVLIB LIB(ITSOIC400) -
D                                     DEV(*SAVF) -
D                                     SAVF(ITSOIC400/TURVIS)')
 *
 * A value to be used to trigger a benevolent 'Trojan Horse'
 *
D Savetti         C                   CONST('ITSOIC400.LIB/TURVIS.FILE')   Extension is FILE
 *                                                                         although it is a
 *                                                                         SAVF (and entered as
 *                                                                         SAVF by the user)
 *
 * Some nice fields to help us through from lower to upper case character conversion
 *     1
D LW              C                   CONST('abcdefghijklmnopqrstuvwxyz')
D UP              C                   CONST('ABCDEFGHIJKLMNOPQRSTUVWXYZ')
 *
D NeverAllow      C                   CONST(-1)
D DontAllow       C                   CONST(0)
D Allow           C                   CONST(1)
D AlwaysAllw      C                   CONST(2)
C/EJECT
 ********************************************************************
 * VARIABLE DEFINITIONS AND LISTS USED BY THIS PROGRAM              *
 ********************************************************************
C/SPACE 2
 *
 * Define binary parameters
 *
D                 DS
D  APPIDds                1      4B 0
D  OPIDds                 5      8B 0
D  IPLENds                9     12B 0
D  OPLENds               13     16B 0
D  ALLOWOPds             17     20B 0
 *
C     *LIKE         DEFINE    APPIDds       APPIDIN
C     *LIKE         DEFINE    OPIDds        OPIDIN
C     *LIKE         DEFINE    IPLENds       IPLENIN
C     *LIKE         DEFINE    OPLENds       OPLENIN
C     *LIKE         DEFINE    ALLOWOPds     ALLOWOP
 *
C     *LIKE         DEFINE    OPINFOIN      OPINFO
 *
 * Define parameter list
 *
C     *Entry        PLIST
 * Input parameters:
C                   PARM                    APPIDIN                        Application ID
 *                                                    possible values:   0 = FTP Client Program
 *                                                                       1 = FTP Server Program
C                   PARM                    OPIDIN                         Operation ID
 *                                                    possible values:   0 = Initialize Session
 *                                                                       1 = Create Dir/Lib
 *                                                                       2 = Delete Dir/Lib
 *                                                                       3 = Set Current Dir
 *                                                                       4 = List Dir/Lib
 *                                                                       5 = Delete Files
 *                                                                       6 = Send Files
 *                                                                       7 = Receive Files
 *                                                                       8 = Rename Files
 *                                                                       9 = Execute CL cmd
C                   PARM                    USRPRF           10            User Profile
C                   PARM                    IPADDRIN         15            Remote IP Address
C                   PARM                    IPLENIN                        Length of IP Address
C                   PARM                    OPINFOIN        999            Operation-spec. Info
C                   PARM                    OPLENIN                        Length of Oper. Spec
 * Return parameter:
C                   PARM                    ALLOWOP                        Allow Operation (Out
 *                                                    possible values:  -1 = Never Allow
 *                                                                           (And don't bother
 *                                                                           me with this ops
 *                                                                           in this session)
 *                                                                       0 = Reject Operation
 *                                                                       1 = Allow Operation
 *                                                                       2 = Always Allow Oper.
 *                                                                           (And don't bother
 *                                                                           me with this ops
 *                                                                           in this session)
C/EJECT
 ********************************************************************
 * The Main Program                                                 *
 ********************************************************************
 *
C                   SELECT
C     APPIDIN       WHENEQ    0
C                   EXSR      ClientRqs
C     APPIDIN       WHENEQ    1
C                   EXSR      ServerRqs
C                   ENDSL
 *
C                   EVAL      *INLR = *ON
C                   RETURN
C/EJECT
 ********************************************************************
 * S U B R O U T I N E S                                            *
 ********************************************************************
 ********************************************************************
 * Here we handle all the FTP Client request validation             *
 ********************************************************************
C     ClientRqs     BEGSR
 *
 * Check user profile
 *
C                   SELECT
 *
 * Check for 'bad' users who are not allowed to do anything ever
 *
C     USRPRF        WHENEQ    'JOEBAD    '
 *
C                   Z-ADD     NeverAllow    ALLOWOP                        Ops not allowed
 *
 * Check for 'normal' users who are not allowed to do some things
 *
C     USRPRF        WHENEQ    'JOENORMAL '
 *
C                   SELECT
 *
C     OPIDIN        WHENEQ    0                                            New Connection
C                   Z-ADD     Allow         ALLOWOP
 *
C     OPIDIN        WHENEQ    1                                            Create Directory/Lib
C     OPIDIN        OREQ      2                                            Delete Directory/Lib
C     OPIDIN        OREQ      5                                            Delete Files
C     OPIDIN        OREQ      7                                            Receive Files from S
C     OPIDIN        OREQ      8                                            Rename files
C     OPIDIN        OREQ      9                                            Execute CL Commands
 *
C                   Z-ADD     NeverAllow    ALLOWOP                        Ops never allowed
 *
C     OPIDIN        WHENEQ    3                                            Set Current Dir
C     OPIDIN        OREQ      4                                            List Directory/Lib
C     OPIDIN        OREQ      6                                            Send Files to Server
 *
 * Extract library and directory names for comparison with allowed areas
 *
C     OPLENIN       IFGE      11
C     11            SUBST     OPINFOIN:1    Directory        11
C                   ELSE
C     OPLENIN       SUBST(P)  OPINFOIN:1    Directory
```

```
   C                   ENDIF
   C  1  LW:UP         XLATE     Directory     Directory
    *
   C     OPLENIN       IFGE      23
   C     23            SUBST     OPINFOIN:1    Library          23
   C                   ELSE
   C     OPLENIN       SUBST(P)  OPINFOIN:1    Library
   C                   ENDIF
    *
   C     Directory     IFEQ      PublicDir                                Allowed Directory
   C     Library       OREQ      PublicLib                                or Library
   C                   Z-ADD     Allow         ALLOWOP
   C                   ELSE
   C                   Z-ADD     DontAllow     ALLOWOP
   C                   ENDIF
    *
   C                   OTHER
   C                   Z-ADD     DontAllow     ALLOWOP
   C                   ENDSL
    *
    * Check for 'cool' users who are allowed to do everything
    *
   C     USRPRF        WHENEQ    'JOEGOOD   '
   C     USRPRF        OREQ      'A960101B  '
   C     USRPRF        OREQ      'A960101C  '
   C     USRPRF        OREQ      'A960101D  '
   C     USRPRF        OREQ      'A960101E  '
   C     USRPRF        OREQ      'A960101F  '
   C     USRPRF        OREQ      'A960101Z  '
    * Allow All FTP Operations
   C                   Z-ADD     AlwaysAllw    ALLOWOP
    *
2   * Any Other User: We leave the back door open and allow
    * all operations. If you want to use this program for securing
    * your system, then close this door!
    *
   C                   OTHER
   C                   Z-ADD     AlwaysAllw    ALLOWOP
   C***************    Z-ADD     NeverAllow    ALLOWOP
   C                   ENDSL
    *
   C                   ENDSR
   C/EJECT
    *********************************************************************
    * Here we handle all the FTP Server request validation              *
    *********************************************************************
   C     ServerRqs     BEGSR
    *
    * Check for ANONYMOUS user
    *
   C     USRPRF        IFEQ      Anonym
    *
   C                   SELECT
    *
   C     OPIDIN        WHENEQ    1                                        Create Directory/Lib
   C     OPIDIN        OREQ      2                                        Delete Directory/Lib
   C     OPIDIN        OREQ      5                                        Delete Files
   C     OPIDIN        OREQ      7                                        Receive Files from C
   C     OPIDIN        OREQ      8                                        Rename files
   C     OPIDIN        OREQ      9                                        Execute CL Commands
    *
   C                   Z-ADD     NeverAllow    ALLOWOP                  Ops never allowed
    *
   C     OPIDIN        WHENEQ    3                                        Set Current Dir
   C     OPIDIN        OREQ      4                                        List Directory/Lib
   C     OPIDIN        OREQ      6                                        Send Files to Client
    *
```

```
 * Extract library and directory names for comparison with allowed areas
 *
C     OPLENIN       IFGE      11
C     11            SUBST     OPINFOIN:1    Directory        11
C                   ELSE
C     OPLENIN       SUBST(P)  OPINFOIN:1    Directory
C                   ENDIF
C  1  LW:UP         XLATE     Directory     Directory
 *
C     OPLENIN       IFGE      23
C     23            SUBST     OPINFOIN:1    Library          23
C                   ELSE
C     OPLENIN       SUBST(P)  OPINFOIN:1    Library
C                   ENDIF
 *
C     Directory     IFEQ      PublicDir                                    Allowed Directory
C     Library       OREQ      PublicLib                                    or Library
C                   Z-ADD     Allow         ALLOWOP
C                   ELSE
C                   Z-ADD     DontAllow     ALLOWOP
C                   ENDIF
 *
C                   OTHER
C                   Z-ADD     DontAllow     ALLOWOP
C                   ENDSL
 *
C                   ELSE
 *
 * Any Other User: Allow All FTP Operations
 *
C     OPIDIN        IFEQ      6                                            Send Files to Client
 *
 * If client issued GET for save file HESSU in library HESSU then we refresh the contents
 *
 *
C     LW:UP         XLATE     OPINFOIN      OPINFO
C                   Z-ADD     0             i                 3 0
C     Savetti       SCAN      OPINFO:1      i
 *
C     i             IFGT      0
 *
 * We assume that the save file exits and here clear the save file
 *
C                   MOVEL(p)  ClearSavf     Cmd              80
C                   Z-ADD     19            Len              15 5
C                   CALL      'QCMDEXC'                            9999
C                   PARM                    Cmd
C                   PARM                    Len
 *
 * and here we save the library to the save file
 *
C                   MOVEL(p)  SaveLib       Cmd
C                   Z-ADD     46            Len
C                   CALL      'QCMDEXC'                            9999
C                   PARM                    Cmd
C                   PARM                    Len
C                   ENDIF
C                   ENDIF
 *
C                   Z-ADD     Allow         ALLOWOP
C                   ENDIF
 *
C                   ENDSR
```

VLRQ0100 exit point format: The exit point for FTP Server Application Request Validation is:

QIBM_QTMF_SERVER_REQ

The exit point for FTP Client Application Request Validation is:

QIBM_QTMF_CLIENT_REQ

The interface that controls the parameter format for the exit point is:

VLRQ0100

The table below shows the parameters and parameter format for the VLRQ0100 interface.

Required Parameter Format for the VLRQ0100 exit point interface

Parameter	Description	Input or Output	Type and length
1	Application identifier	Input	Binary (4)
2	Operation identifier	Input	Binary (4)
3	User profile	Input	Char (10)
4	Remote IP address	Input	Char (10)
5	Length of remote IP address	Input	Binary (4)
6	Operation-specific information	Input	Char (*)
7	Length of operation-specific information	Input	Binary (4)
8	Allow operation	Output	Binary (4)

Here are the parameter descriptions

VLRQ0100 Parameter 1:
Application identifier

INPUT; BINARY(4)
Identifies the TCP/IP application program that is making the request. Four different TCP/IP applications share the VLRQ0100 interface. The first parameter identifies which application is calling the exit program. The possible values are:

0	FTP client program
1	FTP server program
2	REXEC server program
3	TFTP server program

VLRQ0100 Parameter 2:
Operation identifier

Input; Binary(4)
Indicates the operation (command) that the FTP user wants (requests) to perform.

When the application identifier (parameter 1) indicates the FTP client or FTP server program, the possible values are:

Value	Operation ID	Client subcommand	Server subcommand
0	Start session	Open, SECOpen	New connection

Value	Operation ID	Client subcommand	Server subcommand
1	Create directory/library	*	MKD, XMDK
2	Delete directory/library	*	RMD, XRMD
3	Set current directory/library	LCD	CWD, CDUP, XCWD, XCUP
4	List files	*	LIST, NLIST
5	Delete file	*	DELE
6	Send file	APPEND, PUT, MPUT	RETR
7	Receive file	GET, MGET	APPE, STOR, STOU
8	Rename file	*	RNFR, RNTO
9	Execute CL command	SYSCMD	RCMD, ADDm, ADDV, CRTL, CRTP, CRTS, DLTF, DLTL

Note: The symbol * represents control operations that the FTP client exit does not recognize. The only way a client can use these operations is with CL commands using the FTP client subcommand SYSCMD. Operation identifier 9 controls the execution of CL commands.

VLRQ0100 Parameter 3:
User profile

INPUT; Char(10)
The user profile for the FTP session.

VLRQ0100 Parameter 4:
Remote IP address

INPUT; CHAR(*)
The Internet Protocol (IP) address of the remote host system. The format for this string is dotted decimal (123.45.67.89), left justified. The remote host may be a client or a server that is based on the setting of the application identifier parameter.

VLRQ0100 Parameter 5:
Length (in bytes) of the remote IP address (parameter 4)

INPUT; BINARY(4)
The length of the remote IP address (parameter 4).

VLRQ0100 Parameter 6:
Operation-specific information

INPUT; CHAR(*)
Information that describes the requested operation. The contents of this field depend on the values of the operation identifier (parameter 2), and the application identifier (parameter 1). For example:

For operation identifier 0 and application identifier 0
There is no operation-specific information. This field is blank.

For operation identifier 0 and application identifier 1
The operation-specific information contains the IP address of the TCP/IP interface that connects to the local host (FTP server) for this session. The format for this string is dotted decimal (123.45.67.89), left justified.

For operation identifiers 1 through 3
The operation-specific information contains the name of the directory or library in which to perform the operation. The format for the directory or library name is an absolute path name.

For operation identifiers 4 through 8
The operation-specific information contains the name of the file on which to perform the operation. The format for the file name is an absolute path name.

For operation identifier 9
The operation-specific information contains the iSeries Control Language (CL) command the user requests.

You may also want to refer to VLRQ0100 exit point format usage notes.

VLRQ0100 Parameter 7:
Length of operation-specific information

INPUT; BINARY(4)
Indicates the length of the operation-specific information (parameter 6). Length is 0 when the exit point does not provide operation-specific information.

VLRQ0100 Parameter 8:
Allow operation

OUTPUT; BINARY(4)
Indicates whether to allow or reject the requested operation. The possible values are:

-1	*Never* allow this operation identifier: Reject this operation identifier unconditionally for the remainder of the current session. This operation identifier will not call the exit program again.
0	Reject the operation
1	Allow the operation
2	*Always* allow this operation identifier: Allow this operation identifier unconditionally for the remainder of the current session. This operation identifier will not call the exit program again.

VLRQ0100 exit point format usage notes: VLRQ0100 is the exit point format that is used for both the FTP Client Request Validation Exit Point and the FTP Server Request Validation Exit Point.

Invalid Output Parameters

If the output returned for the Allow Operation parameter (parameter 8) is not valid, then the FTP server rejects the requested operation and posts this message to the job log:

Data from exit program for exit point &1 is missing or not valid

Exceptions

If the FTP server encounters any exception when calling the exit program, it posts this message to the job log:

Exception encountered for FTP exit program &1 in library &2 for exit point &3

Summary: Operation-specific information

This table summarizes the Operation-specific information (VLRQ0100 parameter 6)that is required for each Operation identifier (VLRQ0100 parameter 2).

Operation Identifier (VLRQ0100 Parm 2)	Operation-Specific Information (VLRQ0100 Parameter 6)
0	NONE if application ID=0 (parameter 1)
0	Dotted decimal format IP address of client host when application ID=1 or 2 (parameter 1)
1-3	Absolute path name of library or directory. Examples: /QSYS.LIB/QGPL.LIB[(a)] /QOpenSys/DirA/DirAB/DirABC[(b)]
4-8	Absolute path name of file. Examples: /QSYS.LIB/MYLIB.LIB/MYFILE.FILE/MYMEMB.MBR[(a)] /QOpenSys/DirA/DirAB/DirABC/FileA1[(b)]

Notes:

[(a)] - QSYS.LIB file system path names are always in uppercase

[(b)] - QOpenSys file system path names are case sensitive and may include upper and lower case letters.

Server logon exit point

You can control the authentication of users to a TCP/IP application server with the TCP/IP Application Server Logon Exit Point. This exit point allows server access based on the originating session's address. It also allows you to specify an initial working directory that is different from those that are in the user profile.

When you add an exit program to the exit point, the server calls the logon exit program each time a user attempts to log on. The exit program sets the return code output parameter to indicate whether or not the server will continue the logon operation. Alternate return code settings are available for processing the logon, and initializing directory information.

The iSeries exit point for FTP server logon is:

QIBM_QTMF_SVR_LOGON

These are the three exit point formats available:

- The TCPL0100 exit point format allows this basic logon control:
  - Ability to accept or reject a logon
  - Control of the user profile, password, and current library
- The TCPL0200 exit point format provides additional parameters to control the logon process, including:
  - Ability to set the working directory to any directory on the system.
  - Ability to return application-specific information
  - Ability to control encryption of FTP data sent to and received from the FTP client.
- The TCPL0300 exit point format extends the TCPL0200 format to allow usage of OS/400 enhanced password support and provides additional parameters to allow CCSID processing for password and

directory name fields. In addition, when the user for the session has been authenticated with a client certificate, the client certificate is provided to the exit program.

Notes:

1. There can be only one exit program registered for the FTP server logon exit point. You must decide which of the three exit point formats you want to use.
2. For the FTP application, this exit point provides the capability to implement anonymous FTP, including the information required to log and control access.
3. For all character parameters in exit point formats TCPL0100 and TCPL0200, and all character parameters without an associated CCSID in exit point format TCPL0200: Character data passed to the exit program is in the CCSID of the job. If the job CCSID is 65535, the character data is in the default CCSID of the job. Any character data that is returned by the exit program in these parameters is expected to be in this same CCSID.

For anonymous FTP, write your FTP server logon exit program to:

1. Accept logons from user ID ANONYMOUS
2. Request an e-mail address as a password. It is customary to require a 'valid e-mail address' for the password. The term is misleading because the exit program only verifies if there is an '@' symbol in the middle of a string of alphanumeric characters. That too is customary. This is why it is important to log the user's IP address.
3. Check for the @ symbol in the password string.
4. Force ANONYMOUS users to your public access library only. See return code 3 of parameter 8 for TCPL0200 Format).

What your program should include:

- Exception handling
- Debugging
- Logging
  - Log the IP address and e-mail address (sent as a password) of the FTP requester.

Is there an exit program time-out feature?

There is no time-out for FTP exit programs. If the exit program has an error or exception that it cannot handle, the FTP server will abort the session.

QTCP Needs Authority

When the application calls the FTP server logon exit program, the FTP server job is running under the QTCP user profile.

Make sure that QTCP has sufficient authority to access and write to any log files or other satellite files associated with the exit programs.

Example programs

Example programs are available to help you set up anonymous FTP on your server. These examples are for illustration purposes. They do not contain enough features to run on a production machine as is. You can use these samples as a starting point to build your own programs. By copying portions of the code from the samples, you can add them to programs that you write yourself. It is recommended that you run the sample programs on a system other than your production system.

Example: FTP Server Logon exit program in CL code
Example: FTP Server Logon exit program in C code
Example: FTP Server Logon exit program in ILE RPG code

Code example disclaimer

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Example: FTP Server Logon exit program in CL code: This is an example of a simple FTP Server Logon exit program. It is written in iSeries Command Language (CL). This code is not complete, but provides a starting point to help you create your own program.

Note: Read the Code example disclaimer for important legal information.

(Pre formatted text in the following example will flow outside the frame.)

```
/******************************************************************************/
/*                                                                            */
/*    Sample FTP server logon exit program.                                   */
/*    Note:  This program is a sample only and has not undergone any formal   */
/*           review or testing.                                               */
/*                                                                            */
/*  Additional notes:                                                         */
/*  1. When the FTP server logon exit is called, the FTP server job is        */
/*     running under the QTCP user profile.                                   */
/*  2. For the ANONYMOUS case, users can add logging capability (for          */
/*     example, write the E-mail address entered for the password and         */
/*     the client IP address to a log file).                                  */
/*  3. IBM strongly recommends that you create the exit program in a library  */
/*     with *PUBLIC authority set to *EXCLUDE, and give the exit program      */
/*     itself a *PUBLIC authority of *EXCLUDE.  The FTP server adopts         */
/*     authority when it is necessary to resolve and call the exit program.   */
/*                                                                            */
/******************************************************************************/

 TSTLOGCL:   PGM        PARM(&APPIDIN &USRIN &USRLENIN &AUTIN &AUTLENIN +
                          &IPADDRIN &IPLENIN &RETCDOUT &USRPRFOUT &PASSWDOUT +
                          &CURLIBOUT)

/* Declare input parameters */
             DCL        VAR(&APPIDIN)    TYPE(*CHAR) LEN(4)  /* Application identifier  */
             DCL        VAR(&USRIN)      TYPE(*CHAR) LEN(999)/* User ID                 */
             DCL        VAR(&USRLENIN)   TYPE(*CHAR) LEN(4)  /* Length of user ID       */
             DCL        VAR(&AUTIN)      TYPE(*CHAR) LEN(999)/* Authentication string   */
             DCL        VAR(&AUTLENIN)   TYPE(*CHAR) LEN(4)  /* Length of auth. string  */
             DCL        VAR(&IPADDRIN)   TYPE(*CHAR) LEN(15) /* Client IP address       */
             DCL        VAR(&IPLENIN)    TYPE(*CHAR) LEN(4)  /* IP address length       */
             DCL        VAR(&RETCDOUT)   TYPE(*CHAR) LEN(4)  /* return code (out)       */
             DCL        VAR(&USRPRFOUT)  TYPE(*CHAR) LEN(10) /* user profile (out)      */
             DCL        VAR(&PASSWDOUT)  TYPE(*CHAR) LEN(10) /* password (out)          */
             DCL        VAR(&CURLIBOUT)  TYPE(*CHAR) LEN(10) /* current library (out)   */

/* Declare local copies of parameters (in format usable by CL) */
             DCL        VAR(&APPID)      TYPE(*DEC)  LEN(1 0)
             DCL        VAR(&USRLEN)     TYPE(*DEC) LEN(5 0)
             DCL        VAR(&AUTLEN)     TYPE(*DEC) LEN(5 0)
             DCL        VAR(&IPLEN)      TYPE(*DEC) LEN(5 0)

/* Assign input parameters to local copies */
             CHGVAR     VAR(&APPID)      VALUE(%BINARY(&APPIDIN))
             CHGVAR     VAR(&USRLEN)     VALUE(%BINARY(&USRLENIN))
             CHGVAR     VAR(&AUTLEN)     VALUE(%BINARY(&AUTLENIN))
             CHGVAR     VAR(&IPLEN)      VALUE(%BINARY(&IPLENIN))

/* Check for ANONYMOUS user.  Allow for ANONYMOUSA, etc. as "regular"  */
/* user profile. */
             IF         COND(&USRLEN = 9) THEN(DO)
               IF       COND(%SST(&USRIN 1 9) = 'ANONYMOUS') THEN(DO)
/* For anonymous user: want to force user profile ANONYMOUS current library to PUBLIC. */
                 CHGVAR VAR(%BINARY(&RETCDOUT))  VALUE(6)
                 CHGVAR VAR(&USRPRFOUT)  VALUE('ANONYMOUS ')
                 CHGVAR VAR(&CURLIBOUT)  VALUE('PUBLIC    ')
               ENDDO
/* Any other user: proceed with normal logon processing. */
               ELSE     CMD(CHGVAR VAR(%BINARY(&RETCDOUT))  VALUE(1))
             ENDDO
             ELSE       CMD(CHGVAR VAR(%BINARY(&RETCDOUT))  VALUE(1))

 END:        ENDPGM
```

Example: FTP Server Logon exit program in C code: This is an example of a simple FTP Server Logon exit program. It is written in C programming language. This code is not complete, but provides a starting point to help you create your own program.

Note: Read the Code example disclaimer for important legal information.

(Pre formatted text in the following example will flow outside the frame.)

```
/* Module Description *************************************************/
/*                                                                    */
/**********************************************************************/
/*                                                                    */
/* Note:  This program is a sample only and has NOT undergone any     */
/        formal review or testing.                                    */
/*                                                                    */
/**********************************************************************/
/*                                                                    */
/* Source File Name: qtmfsvrlgn.c                                     */
/*                                                                    */
/* Module Name: FTP Server Logon exit program.                        */
/*                                                                    */
/* Service Program Name:  n/a                                         */
/*                                                                    */
/* Source File Description:                                           */
/*   This example exit program provides additional control over the   */
/*    process of authenticating a user to a TCP/IP application server.*/
/*    When installed, this example exit program would be called each  */
/*    time a user attempts to log on to the server.                   */
/*                                                                    */
/**********************************************************************/
/*                                                                    */
/* Function List: main       - FTP Server Logon exit program main.    */
/*                qtmfsvrlgn - FTP Server Logon exit function.        */
/*                CheckClientAddress - Check originating sessions IP  */
/*                                      address.                      */
/*                                                                    */
/* End Module Description *********************************************/
#define _QTMFSVRLGN_C
```

```
/**********************************************************************/
/* All file scoped includes go here                                   */
/**********************************************************************/
#ifndef __stdio_h
#include <stdio.h>
#endif

#ifndef __ctype_h
#include <ctype.h>
#endif

#ifndef __string_h
#include <string.h>
#endif

#ifndef __stdlib_h
#include <stdlib.h>
#endif

#include "qusec.h"            /* Include for API error code structure */
#include "qsyrusri.h"         /* Include for User Information API     */

/**********************************************************************/
/* All file scoped Constants go here                                  */
/**********************************************************************/
#define  EQ      ==
#define  NEQ     !=
#define  BLANK   ' '
#define  FWIDTH  128            /* Width of one database file record  */
#define  FNAME   21             /* Qualified database file name width */

/* Valid characters for Client IP address. The CheckClientAddress()   */
/*  function will check the Client IP address input argument         */
/*  (ClientIPaddr_p) to ensure it is in valid dotted-decimal format.  */
/*  This is one example of an input validity check.                   */
const char ValidChars[] = "0123456789.";
/**********************************************************************/
/* All file scoped type declarations go here                          */
/**********************************************************************/

/**********************************************************************/
/* All file-scoped macro calls go here                                */
/**********************************************************************/

/**********************************************************************/
/* All internal function prototypes go here                           */
/**********************************************************************/
static void qtmfsvrlgn
    (int,char *,int,char *,int,char *,int,int *,char *,char *,char *);

static int CheckClientAddress(char *, int);


/**********************************************************************/
/* All file scoped variable declarations go here                      */
/**********************************************************************/

/**********************************************************************/
/*                            ** NOTE **                              */
/* The following client IP address are for example purposes only. Any */
/* resemblance to actual system IP addresses is purely coincidental.  */
/**********************************************************************/
/* EXCLUSIVE system lists, ie - Logon attempts from any client IP     */
/*                              addresses NOT in one of these lists   */
/*                              are allowed to continue.              */
/* Reject server logon attempts of users attempting to log in from    */
/*  these client systems (return code = 0)                            */
char Reject[] = "1.2.3.4 5.6.7.8";
/* Limit logon abilities of users attempting to log in as ANONYMOUS   */
/*  from these client systems (return code = 6).                      */
/*  In this example program, the initial current library is set and   */
/*  returned as an output parameter for users attempting to log in    */
/*  as ANONYMOUS from these specific client systems.                  */
char Limit[] = "9.8.7.6 4.3.2.1 8.7.6.5";

/* Function Specification *********************************************/
/*                                                                    */
/* Function Name: Main                                                */
/*                                                                    */
/* Descriptive Name: FTP Server Logon exit program main.              */
/*                                                                    */
/*    This example exit program allows access to a TCP/IP server to   */
/*    be controlled by the address of the originating session, gives */
/*    additional control over the initial current library to a user, */
/*    and provides the capability to implement "anonymous" FTP.       */
/*                                                                    */
/* Notes:                                                             */
/*                                                                    */
/*   Dependencies:                                                    */
/*     FTP Server Logon exit point QIBM_QTMF_SVR_LOGON was registered */
/*     during FTP product installation.                               */
/*                                                                    */
/*   Restrictions:                                                    */
/*                                                                    */
/*       None                                                         */
/*                                                                    */
/*   Messages:                                                        */
/*                                                                    */
/*       None                                                         */
/*                                                                    */
/*   Side Effects:                                                    */
/*                                                                    */
/*       None                                                         */
/*                                                                    */
/*   Functions/Macros called:                                         */
/*                                                                    */
/*       qtmfsvrlgn - Server Logon exit function.                     */
/*                                                                    */


/* Input:                                                             */
/*   int  * argv[1]     - Identifies requesting application           */
/*                        (FTP Client =0, FTP Server = 1).            */
/*   char * argv[2]     - User identifier from client program.        */
/*                        (For FTP server, this is user CMD data      */
/*   int  * argv[3]     - Length (in bytes) of User ID string.        */
/*   char * argv[4]     - Authentication string from client.          */
/*                        (For FTP server, this is the password)      */
/*   int  * argv[5]     - Length (bytes) Authentication string.       */
/*   char * argv[6]     - Internet Protocol address from which        */
/*                        the session originates.                     */
/*   int  * argv[7]     - Length (in bytes) of IP address.            */
/*   int  * argv[8]     - Return code (received as 0).                */
/*   char * argv[9]     - User profile (received as blanks).          */
/*   char * argv[10]    - Password (received as blanks).              */
/*   char * argv[11]    - Initial current library (received as blanks)*/
/*                                                                    */
/* Exit Normal: Return Return Code, User Profile, Password, Initial   */
/*             Current Library to server application.                 */
/*                                                                    */
/* Exit Error: None                                                   */
/*                                                                    */
/* End Function Specification *****************************************/
```

```
void main(int argc, char *argv[])
{
  /********************************************************************/
  /* Code                                                             */
  /********************************************************************/

  /********************************************************************/
  /* Collect input arguments and call function to determine if client */
  /*  should be allowed to log in to an FTP server application.       */
  /********************************************************************/
  qtmfsvrlgn(*((int *)(argv[1])), /* Application Identifier
(Input) */
             argv[2],             /* User Identifier          (Input) */
             *((int *)(argv[3])), /* Length User of
Identifier(Input) */
             argv[4],             /* Authentication String    (Input) */
             *((int *)(argv[5])), /* Length of Authentication string  */
(Input) */
             argv[6],             /* Client IP Address        (Input) */
             *((int *)(argv[7])), /* Length of Client IP Address      */
(Input) */
             (int *)(argv[8]),    /* Return Code              (Output)*/
             argv[9],             /* User Profile             (Output)*/
             argv[10],            /* Password                 (Output)*/
             argv[11]);           /* Initial Current Library  (Output)*/
  return;
}



/* Function Specification *********************************************/
/*                                                                    */
/* Function Name: qtmfsvrlgn                                          */
/*                                                                    */
/* Descriptive Name: Server Logon exit function.                      */
/*                                                                    */
/*   This exit function provides control over user authentication to  */
/*    an FTP server.                                                  */
/*                                                                    */
/* Notes:                                                             */
/*                                                                    */
/*   Dependencies:                                                    */
/*                                                                    */
/*       FTP Server Logon exit point QIBM_QTMF_SVR_LOGON was          */
/*        registered during FTP product installation.                 */
/*                                                                    */
/*   Restrictions:                                                    */
/*                                                                    */
/*       None                                                         */
/*                                                                    */
/*   Messages:                                                        */
/*                                                                    */
/*       None                                                         */
/*                                                                    */
/*   Side Effects:                                                    */
/*                                                                    */
/*       None                                                         */
/*                                                                    */
/*   Functions/Macros called:                                         */
/*                                                                    */
/*       CheckClientAddress - Check the ClientIPaddr_p input argument.*/
/*       memcpy  - Copy bytes from source to destination.             */
/*       memset  - Set bytes to value.                                */
/*       strstr  - Locate first occurrence of substring.              */
/*       sprintf - Formatted print to buffer.                         */
/*                                                                    */
/* Input:                                                             */
/*   int    ApplId            - Application Identifier (Server = 1).  */
/*   char * UserId_p          - User identifier from client program.  */
/*                              (For FTP server, USER subcommand data)*/
/*   int    Lgth_UserId       - Length (in bytes) of user ID string.  */
/*   char * AuthStr_p         - Authentication string from client.    */
/*                              (For FTP server, this is the password)*/
/*   int    Lgth_AuthStr      - Length (bytes) Authentication string. */
/*   char * ClientIPaddr_p    - Internet Protocol address from which  */
/*                              the session originates.               */
/*   int *  Lgth_ClientIPaddr - Length (in bytes) of IP address.      */
/*                                                                    */


/* Output:                                                            */
/*   int * ReturnCode: Indicates degree of success of operation:      */
/*        ReturnCode = 0 - Reject logon.                              */
/*        ReturnCode = 1 - Continue logon; use initial current library*/
/*        ReturnCode = 2 - Continue logon; override initial current   */
/*                         library                                    */
/*        ReturnCode = 3 - Continue logon; override user, password    */
/*        ReturnCode = 4 - Continue logon; override user, password,   */
/*                         current library                            */
/*        ReturnCode = 5 - Accept logon; override user profile        */
/*        ReturnCode = 6 - Accept logon; override user profile,       */
/*                         current library                            */
/*   char * UserProfile  - User profile to use for this session       */
/*   char * Password     - Password to use for this session           */
/*   char * Init_Cur_Lib - Initial current library for this session   */
/*                                                                    */
/* Exit Normal: (See OUTPUT)                                          */
/*                                                                    */
/* Exit Error:  None                                                  */
/*                                                                    */
/* End Function Specification ****************************************/
static void qtmfsvrlgn(int ApplId,                  /* Entry point */
                        char *UserId_p,
                        int Lgth_UserId,
                        char *AuthStr_p,
                        int Lgth_AuthStr,
                        char *ClientIPaddr_p,
                        int Lgth_ClientIPaddr,
                        int *ReturnCode,
                        char *UserProfile_p,
                        char *Password_p,
                        char *InitCurrLib_p)
{
  /********************************************************************/
  /* Local Variables                                                  */
  /********************************************************************/
  /* The following lists serve as an example of an additional layer   */
  /*  of control over user authentication to an application server.   */
  /*  Here, logon operations using the following user identifiers     */
  /*  will be allowed to continue, but the output parameters returned */
  /*  by this example exit program will vary depending on which list  */
  /*  a user identifier (UserId_p) is found in.         */
  /*  For example, attempts to logon as FTPUSR11 or FTPUSR2 will be   */
  /*  allowed, and this example exit will return the initial current  */
  /*  library as an output parameter along with a return code of 2.   */
  /********************************************************************/
  /* Continue the logon operation, Return Code = 1                    */
  char Return1[] = "FTPUSR10  ";
  /* Continue the logon operation, Return Code = 2                    */
  char Return2[] = "FTPUSR11  FTPUSR2   ";
  /* Continue the logon operation, Return Code = 3                    */
  char Return3[] = "FTPUSR12  FTPUSR3   FTPUSR23  ";
  /* Continue the logon operation, Return Code = 4                    */
  char Return4[] = "FTPUSER   FTPUSR4   FTPUSR24  FTPUSR94  ";
```

```
int rc;                       /* Results of server logon request    */
Qsy_USRI0300_T Receiver_var;  /* QSYRUSRI API Receiver variable     */
int   Lgth_Receiver_var;      /* Receiver variable length           */
char  Format_Name[8];     /* Format name buffer           */
char  User_Id[10];        /* User Identifier buffer       */
Qus_EC_t error_code =         /* QSYRUSRI API error code structure: */
{
 sizeof(Qus_EC_t),      /* Set bytes provided         */
 0,                                   /* Initialize bytes available */
 ' ',' ',' ',' ',' ',' ',' '          /* Initialize Exception Id    */
};
char *pcTest_p;               /*  Upper-case User Identifier pointer*/
int i;                        /* "For" loop counter variable        */



/********************************************************************/
/* Code                                                             */
/********************************************************************/

/* Test validity of application ID input argument.                  */
if(1 NEQ ApplId)
  {
  /* ERROR - Not FTP server application.                            */
  /*         Return Code of 0 is used here to indicate              */
  /*         that an incorrect input argument was received.         */
  /*         The server logon operation will be rejected.           */
  rc = 0;                               /* Application ID not valid */
  }      /* End If the application identifier is NOT for FTP server */
else                       /* FTP server application identifier     */
  {
  /* Validate the client IP address input argument.                 */
  rc = CheckClientAddress(ClientIPaddr_p,
                    Lgth_ClientIPaddr);
  if(0 NEQ rc)                  /* Valid, acceptable client address */
    {
    /* Initialize User_Id; used to hold upper-cased user identifier */
    memset(User_Id, BLANK, sizeof(User_Id));

    /* Initialize pcTest_p to point to UserId_p input argument.     */
    pcTest_p = UserId_p;

    /* Uppercase all of the user ID to compare for ANONYMOUS user.  */
    for(i = 0; i < Lgth_UserId; i++)
      {
      User_Id[i] = (char)toupper(*pcTest_p);
      pcTest_p += 1;
      }

    /* If user has logged in as ANONYMOUS.                          */
    if(0 == memcmp("ANONYMOUS ", User_Id, 10))
      {
      /* Determine how to continue with ANONYMOUS logon attempt.    */
      if(NULL NEQ strstr(Limit, ClientIPaddr_p))
        {
        /* If users system IP address is found in the "Limit" list, */
        /*  return ReturnCode of 6, user profile and initial        */
        /*  current library values as output parameters.            */
        memcpy(UserProfile_p, "USERA1    ", 10);
        memcpy(InitCurrLib_p, "PUBLIC    ", 10);
        rc = 6;
        }
      else
        {
        /* Users system IP address is NOT found in the "Limit" list,*/
        /*  return ReturnCode of 5, user profile output parameter;  */
        /* use the initial current library that is specified by the */
        /* user profile information.                                */
        memcpy(UserProfile_p, "USERA1    ", 10);
        rc = 5;
        }
      }                                 /* End If USER is ANONYMOUS */


    else                          /* Else USER is not ANONYMOUS     */
      {
      /* Set receiver variable length.                              */
      Lgth_Receiver_var = sizeof(Qsy_USRI0300_T);
      /* Set return information format.                             */
      memcpy(Format_Name, "USRI0300", sizeof(Format_Name));
      /* Set user identifier passed in.                             */
      memset(User_Id, BLANK, sizeof(User_Id));
      memcpy(User_Id, UserId_p, Lgth_UserId);
      /* Call QSYRUSRI - Retrieve User Information API              */
      QSYRUSRI(&Receiver_var,    /* Return Information receiver var */
               Lgth_Receiver_var,/* Receiver variable length        */
               Format_Name,      /* Return information format name  */
               User_Id,          /* User ID seeking information     */
               &error_code);     /* Error return information        */
      /* Check if an error occurred (byte_available not equal 0)    */
      if(0 NEQ error_code.Bytes_Available)
        {
        /* Return ReturnCode of 0 only (Reject logon);              */
        rc = 0;                      /* Reject the logon operation  */
        *ReturnCode = rc;            /* Assign result to ReturnCode */
        }
      else          /* No error occurred from Retrieve User Info    */
        {           /* (Bytes_Available = 0)                        */
        /* Set current library for user profile.                    */
        memcpy(InitCurrLib_p, Receiver_var.Current_Library, 10);
        if(NULL NEQ strstr("*CRTDFT   ",
                          Receiver_var.Current_Library))
          {
          memcpy(InitCurrLib_p, "FTPDEFAULT", 10);
          }
        else
          {
          if(NULL NEQ strstr(Return1, UserId_p))
            {
            /* Return ReturnCode of 1 (Continue logon);             */
            /*  Also return user profile and password output        */
            /*  parameters to endure they are ignored by the server.*/
            memcpy(UserProfile_p, UserId_p, Lgth_UserId);
            memcpy(Password_p, AuthStr_p, Lgth_AuthStr);
            rc = 1;                 /* Continue the logon operation */

            }
          else
            {
            if(NULL NEQ strstr(Return2, UserId_p))
              {
              /* Return ReturnCode of 2, and initial current library*/
              /*  Also return user profile and password values      */
              /*  even though they will be ignored by the server.   */
              memcpy(UserProfile_p, UserId_p, Lgth_UserId);
              memcpy(Password_p, AuthStr_p, Lgth_AuthStr);
              memcpy(InitCurrLib_p, "FTPEXT2",
                                    strlen("FTPEXT2"));
              rc = 2;          /* Continue logon; return InitCurLib */
              }


            else
              {
                if(NULL NEQ strstr(Return3, UserId_p))
                  {
                  /* Return ReturnCode of 3, user profile, password.  */
                  /*  Also return initial current library value,      */
                  /*  even though it will be ignored.                 */
                  memcpy(UserProfile_p, UserId_p, Lgth_UserId);
                  memcpy(Password_p, AuthStr_p, Lgth_AuthStr);
                  memcpy(InitCurrLib_p, "FTPEXT3",
                                strlen("FTPEXT3")); /* Server ignores */
                  rc = 3;
                  }
                else
                  {
                  if(NULL NEQ strstr(Return4, UserId_p))
                    {
                    /*Return ReturnCode of 4, user profile,           */
                    /* password, and initial current library values   */
                    memcpy(UserProfile_p, UserId_p, Lgth_UserId);
                    memcpy(Password_p, AuthStr_p, Lgth_AuthStr);
                    memcpy(InitCurrLib_p, "FTPEXT4",
                                           strlen("FTPEXT4"));
                    rc = 4;
                    }
                  else
                    /* This is the default return code for logon      */
                    /* attempts using any user identifier not         */
                    /* explicitly found in one of the four lists in   */
                    /* the local variables section of this function.  */
                    {
                    /*Return ReturnCode of 1, continue logon operation*/
                    rc = 1;
                    }
                  }
                }
              }
            }
          }             /* End No error occurred (byte_available = 0) */
        }             /* End Else USER is not ANONYMOUS               */
      }             /* End Valid, acceptable client address           */
    }             /* End FTP server application identifier            */
  *ReturnCode = rc;
  return;
}                                         /* End program qtmfsvrlgn.c */
```

```
/* Function Specification *********************************************/
/*                                                                    */
/* Function Name: CheckClientAddress                                  */
/*                                                                    */
/* Descriptive Name: Check the IP address of the originating session  */
/*                    from the input argument (ClientIPaddr_p) to     */
/*                    ensure it is in valid dotted-decimal format,    */
/*                    and that the client system is allowed access.   */
/*                    This is an example of an input validity check.  */
/*                                                                    */
/* Notes:                                                             */
/*                                                                    */
/*   Dependencies:                                                    */
/*      None                                                          */
/*                                                                    */
/*   Restrictions:                                                    */
/*       None                                                         */
/*                                                                    */
/*   Messages:                                                        */
/*       None                                                         */
/*                                                                     */
/*   Side Effects:                                                     */
/*       None                                                          */
/*                                                                     */
/*   Functions/Macros called:                                          */
/*                                                                     */
/*       strspn - Search for first occurrence of a string.            */
/*                                                                     */
/* Input:                                                              */
/*   char * ClientIPaddr_p    - Internet Protocol address from which  */
/*                              the session originates.                */
/*   int *  Lgth_ClientIPaddr - Length (in bytes) of IP address.      */
/*                                                                     */
/* Output:                                                             */
/*   int    rc                - Return code indicating validity of IP */
/*                              address from ClientIPaddr_p input.    */
/*                            0 = Reject the logon operation.         */
/*                                ClientIPaddr_p is one that is not   */
/*                                allowed, or contains a character    */
/*                                that is not valid.                  */
/*                            1 = Continue the logon operation.       */
/*                                                                     */
/* Exit Normal: (See OUTPUT)                                           */
/*                                                                     */
/* Exit Error:  None.                                                  */
/*                                                                     */
/* End Function Specification *****************************************/


static int CheckClientAddress(char *ClientIPaddr_p,  /* Entry point */
                                int Lgth_ClientIPaddr)
{
  /*********************************************************************/
  /* Local Variables                                                   */
  /*********************************************************************/
  int rc;                                               /* Return code */

  /*********************************************************************/
  /* Code                                                              */
  /*********************************************************************/
  /* Check that client IP address input argument is dotted-decimal    */
  /*  format of minimum length, with no leading blanks or periods,    */
  /*  and contains only valid characters.                              */
  if((Lgth_ClientIPaddr < 7) ||         /* Minimum IP address size */
     (strspn(ClientIPaddr_p, ValidChars) < Lgth_ClientIPaddr)||
     (strspn(ClientIPaddr_p, ".") EQ 1)||  /* Leading '.' in IP       */
     (strspn(ClientIPaddr_p, " ") EQ 1))   /* Leading blank in IP     */
    {
    /* Client's IP address not valid, or contains an incorrect character */
    rc = 0;              /* Client IP address input argument not valid  */
    }
  else
    {
    /* Is client system allowed to log in to FTP server?             */
    if(NULL NEQ strstr(Reject, ClientIPaddr_p))
      {
      /* Return code = 0 - Reject the server logon operation, as the  */
      /*                  client IP address is found in the global   */
      /*                  "Reject" list.                              */
      rc = 0;                         /* Reject the logon operation   */
      }
    else
      {
      /* Continue the server logon operation checks.                 */
      rc = 1;                         /* Continue the logon operation */
      }
    }
  return(rc);
}

#undef _QTMFSVRLGN_C
```

Example: FTP Server Logon exit program in ILE RPG code: This is an example of a simple FTP Server Logon exit program. It is written in ILE RPG. This code is not complete, but provides a starting point to help you create your own program.

Note: Read the Code example disclaimer for important legal information.

(Pre formatted text in the following example will flow outside the frame.)

```
    * Module Description ***********************************************
    *                                                                  *
    ********************************************************************
    *                                                                  *
    * Note:  This program is a sample only and has NOT undergone any   *
    *        formal review or testing.                                 *
    *                                                                  *
    ********************************************************************
    *                                                                  *
    *                      PROGRAM FUNCTION                            *
    *                                                                  *
    * This program demonstrates some of the abilities an FTP Server    *
    * Logon Exit Program can have.                                     *
    *                                                                  *
    ********************************************************************
   F/SPACE 3
    ********************************************************************
    *                                                                  *
    *                       INDICATOR USAGE                            *
    *                                                                  *
    *   IND.  DESCRIPTION                                              *
    *                                                                  *
    *    LR - CLOSE FILES ON EXIT                                      *
    *                                                                  *
    ********************************************************************
   F/EJECT
    ********************************************************************
    * DATA STRUCTURES USED BY THIS PROGRAM                             *
    ********************************************************************
    *
    * Define constants
    *
1  D Anonym          C                   CONST('ANONYMOUS ')
   D Text1           C                   CONST('Anonymous (')
   D Text2           C                   CONST(') FTP logon')
   D InvalidNet      C                   CONST('10.')
   C/EJECT
    ********************************************************************
    * VARIABLE DEFINITIONS AND LISTS USED BY THIS PROGRAM              *
    ********************************************************************
   C/SPACE 2
    *
    * Define binary parameters
    *
   D                 DS
   D  APPIDds                1      4B 0
   D  USRLENds               5      8B 0
   D  AUTLENds               9     12B 0
   D  IPLENds               13     16B 0
   D  RETCDds               17     20B 0
    *
   C     *LIKE         DEFINE    APPIDds       APPIDIN
   C     *LIKE         DEFINE    USRLENds      USRLENIN
```

```
C     *LIKE         DEFINE    AUTLENds      AUTLENIN
C     *LIKE         DEFINE    IPLENds       IPLENIN
C     *LIKE         DEFINE    RETCDds       RETCDOUT
 *
 * Define parameter list
 *
C     *Entry        PLIST
 * Input parameters:
C                   PARM                    APPIDIN                        Application ID
 *                                                    possible values:   1 = FTP Server Program
C                   PARM                    USRIN           999            User ID
C                   PARM                    USRLENIN                       Length of User ID
C                   PARM                    AUTIN           999            Authentication Strg
C                   PARM                    AUTLENIN                       Length of Auth. Strg
C                   PARM                    IPADDRIN         15            Client IP Address
C                   PARM                    IPLENIN                        Length of IP Address
 * Return parameters:
C                   PARM                    RETCDOUT                       Return Code (Out)
 *                                                    possible values:   0 = Reject Logon
 *                                                                       1 = Continue Logon
 *                                                                       2 = Continue Logon,
 *                                                                           override current
 *                                                                           library
 *                                                                       3 = Continue Logon,
 *                                                                           override user prf,
 *                                                                           password
 *                                                                       4 = Continue Logon,
 *                                                                           override user prf,
 *                                                                           password, current
 *                                                                           library
 *                                                                       5 = Accept logon with
 *                                                                           user prf returned
 *                                                                       6 = Accept logon with
 *                                                                           user prf returned,
 *                                                                           override current
 *                                                                           library
C                   PARM                    USRPRFOUT        10            User Profile (Out)
C                   PARM                    PASSWDOUT        10            Password (Out)
C                   PARM                    CURLIBOUT        10            Current Lib. (Out)
C/EJECT
 ********************************************************************
 * THE MAIN PROGRAM                                                 *
 ********************************************************************
 *
 * Check for ANONYMOUS user
 *     1
C     USRLENIN      SUBST(P)  USRIN:1       User             10
C     User          IFEQ      Anonym
C                   MOVEL     Anonym        USRPRFOUT
 *
 * Check if the user entered something as a e-mail address
 *
C     AUTLENIN      IFGT      *ZERO                                        E-mail addr. entered
 *
 * Check if the E-mail address is a valid one
 *
C                   Z-ADD     0             i                 3 0
C     '@'           SCAN      AUTIN:1       i                              Valid E-mail address
 *                                                                         contains @ character
 *
C     i             IFGT      0                                            Found a '@'
C     AUTLENIN      SUBST(P)  AUTIN:1       Email            30
C                   Z-ADD     5             RETCDOUT                       Accept Logon
 *
 * Log Anonymous FTP Logon to message queue QSYSOPR
 * (The logging should be done to a secure physical file!!!!!!!)
 *
```

```
C     Text1         CAT(p)    Email:0       Message          43
C     Message       CAT(p)    Text2:0       Message
C     Message       DSPLY     'QSYSOPR'
 *
C                   ELSE                                                   Invalid E-mail addr
C                   Z-ADD     0             RETCDOUT                       Reject Logon attempt
C                   ENDIF
 *
C                   ELSE                                                   No E-mail address
C                   Z-ADD     0             RETCDOUT                       Reject Logon attempt
C                   ENDIF
 *
C                   ELSE
 *
 * Any Other User: Proceed with Normal Logon Processing, but the Client address must not belong
 *                 to network 10.xxx.xxx.xxx
 *
C     3             SUBST     IPADDRIN:1    TheNet            3
C     TheNet        IFEQ      InvalidNet                                   Wrong Net
C                   Z-ADD     0             RETCDOUT                       Reject Logon attempt
C                   ELSE                                                   Right Net
C                   Z-ADD     1             RETCDOUT                       Continue with Logon
C                   ENDIF
 *
C                   ENDIF
 *
C                   EVAL      *INLR = *ON
C                   RETURN
```

TCPL0100 exit point format:
Exit Point Format Name: TCPL0100
Exit Point Name: QIBM_QTMF_SVR_LOGON
Exit Point Name: QIBM_QTMX_SVR_LOGON

This is the required parameter group:

1	Application identifier	Input	Binary(4)
2	User identifier	Input	Char(*)
3	Length of user identifier	Input	Binary(4)
4	Authentication string	Input	Char(*)
5	Length of authentication string	Input	Binary(4)
6	Client IP address	Input	Char(*)
7	Length of client IP address	Input	Binary(4)
8	Return code	Output	Binary(4)
9	User profile	Output	Char(10)
10	Password	Output	Char(10)
11	Initial current library	Output	Char(10)

Parameter Descriptions

Application identifier INPUT; BINARY(4) Identifies the requested application server. The valid values are:

1
FTP server program

2
REXEC server program

User identifier
INPUT; CHAR(*) The user identification supplied by the client program. For the FTP server, this parameter contains the data field from the USER subcommand.

Length of user identifier
INPUT; BINARY(4) The length (in bytes) of the user identifier string.

Authentication string
INPUT; CHAR(*) The string (such as a password) supplied by the client program.

For the FTP server, this parameter contains the data field from the PASS (password) subcommand. Beginning with V5R1, if the user is authenticated via a client certificate, no data is provided for this parameter.

Length of authentication string
INPUT; BINARY(4) The length (in bytes) of the authentication string.

Note: For the FTP server: When the user is authenticated via a client certificate, this parameter is set to 0.

Client IP address
INPUT; CHAR(*) The Internet Protocol (IP) address from which the session originates. This string is in dotted decimal format, left justified.

Length of client IP address
INPUT; BINARY(4) Indicates the length (in bytes) of the client IP address.

Return code
OUTPUT; BINARY(4) Indicates whether to accept or reject the logon operation, to perform password authentication, and whether or not to override the initial current library. The valid values are:

0
Reject the logon operation. Ignore the user profile, password, and initial current library output parameters.

1
Continue the logon operation with the specified user identifier and authentication string, and the user-specified the initial current library. The user identifier becomes the user profile, and the authentication string becomes the password. The program ignores the user profile, password, and initial current library output parameters.

Note: For the logon to succeed, the authentication string must match the user profile-specified password.

2
Continue the logon operation with the specified user identifier and authentication string, and override the initial current library with the one specified by the initial current library parameter. The user identifier is the user profile. The authentication string is the password. Provide the initial current library output parameter. The program ignores the user profile and password output parameters.

Note: For the logon to succeed, the authentication string must match the user profile-specified password.

3
Continue the logon operation. Override the user profile and password with those values you received from the output parameters of this exit program. Use the user profile-specified initial current library that the exit program returns. The program ignores the initial current library output parameter.

Note: For the logon to succeed, the password output parameter must match the user profile-specified password.
Attention! IBM strongly recommends that you **never** code passwords directly in an exit program. Encryption, for example, allows algorithmic password determination.

4
Continue the logon operation, which will override the user profile, password, and initial current library with output parameters of this exit program.

Note: For the logon to succeed, the password output parameter must match the user profile-specified password.
Attention! IBM strongly recommends that you **never** code passwords directly in an exit program. Encryption, for example, allows algorithmic password determination.

5
Accept the logon operation. Override the user profile is returned in the user profile output parameter of this exit program. Use the initial current library specified by the user profile, returned by this exit program. The program ignores the output parameters for the initial current library and password.

Note: Specifying this value will override normal OS/400 password processing. It is the only password authentication.

6
Accept the logon operation. Override the user profile and initial current library with those that are returned in the output parameters of this exit program. Ignore the output parameter for password.

Note: Specifying this value will override normal OS/400 password processing. It is the only password authentication.

User profile
OUTPUT; CHAR(10) The user profile to use for this session. This parameter must be left justified and padded with blanks.

Password
OUTPUT; CHAR(10) The password to use for this session. This parameter must be left justified and padded with blanks.

Initial current library
OUTPUT; CHAR(10) The initial current library to be established for this session. This parameter must be left justified and padded with blanks.

Go To:

- TCPL0100 Format Usage Notes

You may also need to refer to:

- TCPL0200 Format: This exit point provides additional parameters to control the logon process.
- TCPL0300 Format: This exit point identifies the application server from which the request is being made.
- Server logon exit point: You can control the authentication of users to a TCP/IP application server with this TCP/IP Application Server Logon Exit Point.

TCPL0100 format usage notes: For FTP, if any of the returned output parameters are not valid, the FTP server will not allow the operation. In this case, the FTP server issues the message `Data from exit program for exit point &1 is missing or not valid` to the job log.

For FTP, if you encounter any exception when you call the exit program, the FTP server issues this message: `Exception encountered for FTP exit program &1 in library &2 for exit point &3`

This table summarizes what the FTP sever will do, depending on the value of the return code (parameter 8) that is returned to the FTP server by the exit program.

Note: A value of 'Return value' indicates that the exit program must return the appropriate value for that output parameter. The value will then be used by the FTP server to complete the logon request process.

Return Code	User Profile (9)	Password (10)	Initial Lib (11)
0	Ignored	Ignored	Ignored
1	(User identifier, parameter 2)	(Password, parameter 4)	(From user profile)
2	(User identifier, parameter 2)	(Password, parameter 4)	Return value
3	Return value	Return value	(From user profile)
4	Return value	Return value	Return value
5	Return value	Ignored	(From user profile)
6	Return value	Ignored	Return value

In the table above, the values in parentheses indicate what the TCP/IP application uses for information when it ignores the output value. The entry `Ignored` means that it used no value; therefore return nothing for that return code value.

For the FTP server (exit point QIBM_QTMF_SVR_LOGON, application identifier 1): when the user identifier is `ANONYMOUS` and this exit point adds the exit program, the server issues this special reply when requesting the password: `331 Guest logon in process, send complete e-mail address as password`. The application issues this message before calling the exit program.

After the application accepts the server logon, the FTP server issues this reply: `230 Guest logon accepted, access restrictions apply`

For the REXEC server (application identifier 2):

1. If the return allow operation output parameter is not valid, the REXEC server will not allow the operation. The REXEC server issues the message “Data from exit program for exit point &1 is missing or not valid” to the job log
2. If the REXEC server encounters any exception when calling the exit program, the REXEC server will not allow the operation. It issues the message “Exception encountered for REXEC exit program &1 in library &2 for exit point &3,” to the job log.

TCPL0200 exit point format:
Exit Point Format Name: TCPL0200
Exit Point Name: QIBM_QTMF_SVR_LOGON

This is the required parameter group:

1	Application identifier	Input	Binary(4)
2	User identifier	Input	Char(*)
3	Length of user identifier	Input	Binary(4)
4	Authentication string	Input	Char(*)
5	Length of authentication string	Input	Binary(4)
6	Client IP address	Input	Char(*)
7	Length of client IP address	Input	Binary(4)
8	Allow logon	Output	Binary(4)
9	User profile	Output	Char(10)
10	Password	Output	Char(10)
11	Initial current library	Input/Output	Char(10)
12	Initial home directory	Output	Char(*)
13	Length of initial home directory	Input/Output	Binary(4)
14	Application-specific information	Input/Output	Char(*)
15	Length of application-specific information	Input	Binary(4)

Parameter Descriptions

Application identifier
INPUT; BINARY(4) Identifies the application server from which the request is being made. The valid values are:

1
FTP server program

User identifier
INPUT; CHAR(*) The user identification supplied by the client program. For the FTP server, this parameter contains the data field from the USER subcommand.

Length of user identifier
INPUT; BINARY(4) The length (in bytes) of the user identifier string.

Authentication string
INPUT; CHAR(*) The string (such as a password) supplied by the client program.

For the FTP server, this parameter contains the data field from the PASS (password) subcommand. Beginning with V5R1, if the user is authenticated via a client certificate, no data is provided for this parameter.

Length of authentication string
INPUT; BINARY(4) The length (in bytes) of the authentication string.

Note: For the FTP server: When the user is authenticated via a client certificate, this parameter is set to 0.

Client IP address
INPUT; CHAR(*) The Internet Protocol (IP) address from which the session originates. This string is in dotted decimal format, left justified.

Length of client IP address
INPUT; BINARY(4) Indicates the length (in bytes) of the client IP address.

Allow logon
OUTPUT; BINARY(4) Indicates whether the logon operation should be accepted or rejected, and how password authentication is performed. The valid values are:

0
Reject the logon operation. Ignores all other output parameters.

1
Continue the logon operation with the specified user identifier and authentication string. The user identifier is the user profile, and the authentication string is the password. The current library and working directory is based on the settings of those output parameters. The application ignores the user profile and password output parameters.

Note: For the logon to succeed, the authentication string must match the user profile-specified password.

2
Continue the logon operation. Override the user profile and password with the returned values in the output parameters of this exit program. The application initializes the current library and working directory based on the settings of those output parameters.

Note: For the logon to succeed, the password output parameter must match the user profile-specified password.
Attention! IBM strongly recommends that you **never** code passwords directly in an exit program. Encryption, for example, allows algorithmic password determination.

3
Accept the logon operation. Override the user profile with the profile returned in the user profile output parameter of this exit program. The program initializes the current library and working directory based on the settings of the output parameters. It ignores the password output parameter.

Note: If your system is running at a security level of 20 or higher, specifying this value overrides normal OS/400 password processing. This is the only password authentication.

User profile
OUTPUT; CHAR(10) The user profile to use for this session. When required, this parameter must be left justified and padded with blanks.

Password
OUTPUT; CHAR(10) The password to use for this session. When required, this parameter must be left justified and padded with blanks.

Initial current library
OUTPUT; CHAR(10) The initial current library to use for this session. When required, this parameter must be left justified and padded with blanks. This parameter is set to the following special value when the exit program is called:

***CURLIB**
Use the current library that the user profile specifies.

Initial home directory
OUTPUT; CHAR(*) The initial setting of the home directory to use for this session. When specified, this parameter must be a valid absolute path name, and the length of initial home directory parameter set to the proper value.

Length of initial home directory
INPUT/OUTPUT; BINARY(4) The length of the initial home directory parameter returned by the exit program. This parameter initializes at zero when the application calls the exit program. If the exit program does not change the value of the parameter, the home directory is initialized to the home directory that the user's profile specifies.

Application-specific information
INPUT/OUTPUT; CHAR(*) Information that is used to communicate application-specific logon settings. For the correct format, see Format of application-specific information parameter.

Length of application-specific information INPUT; BINARY(4) The length (in bytes) of the application-specific information.

You may also need to refer to:

- Server logon exit point: You can control the authentication of users to a TCP/IP application server with this TCP/IP Application Server Logon Exit Point.

Format of application-specific information parameter: When the application identifier indicates the FTP server program, the application-specific information parameter has these fields:

Offset Dec	Offset Hex	Type	Field
0	0	BINARY(4)	Initial name format
4	4	BINARY(4)	Initial current working directory
8	8	BINARY(4)	Initial file listing format
12	C	BINARY(4)	Control connection security mechanism
16	10	BINARY(4)	Data connection encryption option
20	14	BINARY(2)	Control connection ciphersuite

Offset Dec	Offset Hex	Type	Field
22	16	BINARY(2)	Data connection cyphersuite

Field Descriptions

Initial name format
Identifies the initial setting of the file name format for this session. When the exit program is called, the value of this field is set to correspond to the FTP server configuration file value specified by the NAMEFMT parameter. Valid values are:

0
Use the LIBRARY/FILE.MEMBER name format. This setting corresponds to the NAMEFMT(*LIB) option of the CHGFTPA command and is equivalent to specifying the SITE NAMEFMT 0 subcommand to the FTP server.

1
Use the path name format. This setting corresponds to the NAMEFMT(*PATH) option of the CHGFTPA command and is equivalent to specifying the SITE NAMEFMT 1 subcommand to the FTP server.

Initial current working directory
Identifies the initial setting of the FTP server current working directory, which is the default directory that is used for file and list operations. When the exit program is called, the value of this field is set to correspond to the FTP server configuration values specified by the CURDIR. Valid values are:

0
Use the current library as the initial FTP server current working directory. This setting corresponds to the CURDIR(*CURLIB) option of the CHGFTPA command.

1
Use the home directory as the initial FTP server current working directory. This setting corresponds to the CURDIR(*HOMEDIR) option of the CHGFTPA command.

Note: If you set this field to 1, you must also set the initial name format field to 1.

Initial file list format
Identifies the initial setting of the file list format for this session. When the exit program is called, the value of this field is set to correspond to the FTP server configuration value that you specify with the LISTFMT parameter. Valid values are:

0
Use iSeries server file list format. This setting corresponds to the LISTFMT(*DFT) option of the CHGFTPA command and is equivalent to specifying the SITE LISTFMT 0 subcommand to the FTP Server.

1
Use the UNIX file list format. This setting corresponds to the LISTFMT(*UNIX) option of the CHGFTPA command and is equivalent to specifying the SITE LISTFMT 1 subcommand to the FTP server.

Control connection security mechanism
Identifies the security mechanism used on to control connection for this FTP session. Valid values are:

0
The control connection is not secured. **1**

The control connection is secured using Sockets Layer (SSL); the mechanism specified by the FTP client on the AUTH subcommands is TLS-P or SSL.

2
The control connection is secured using SSL; the mechanism specified by the client on the AUTH subcommand is TLS-C or TLS.

Notes:

- This field is input only to the exit program. Changes made by the exit program are ignored.
- For sessions connecting to the secure FTP port, the value is set to 1. Connections to the secure FTP port act as if an implicit AUTH SSL subcommand has been sent to the FTP server.

Data connection encryption option
Specifies whether FTP data connections for this FTP session are to be encrypted. Valid values are:

-1
Encryption of FTP data connections is not allowed for this FTP session.

0
Encryption of FTP data connections is allowed (but not required) for this FTP session.

1
Encryption of FTP data connections is required for this FTP session.

Notes:

- If the control connection security mechanism value is 1, setting the data connection encryption option to -1 will require additional FTP subcommands from the client to successfully transfer data. (The TLS-P/SSL security mechanism encrypts data connections by default.)
- If the control connection security mechanism value is 2, setting the data connection encryption option to 1 will require additional FTP subcommands from the client to successfully transfer data. (The TLS-C/TLS security mechanism does not encrypt data connections by default.)

Control connection ciphersuite
Identifies the SSL ciphersuite used to encrypt on the control connection for this FTP session. Ciphersuite values are defined in the Secure Sockets Layer (SSL) APIs. For information about these APIs, see the Secure Sockets Layer (SSL) APIs topic under **Programming** in the iSeries Information Center.

Notes:

- This field is input only to the exit program. Changes made by the exit program are ignored.
- This value is valid only when the control connection security mechanism value is 1 or 2.

Data connection ciphersuite
Identifies the SSL ciphersuite used to encrypt data on data connection for this FTP session. When

the exit program is called, this value is set to 0, which means to allow the secure sockets layer support negotiate the ciphersuite to be used. If the exit program changes this field, a valid ciphersuite value must be specified. Ciphersuite values are defined in the Secure Sockets Layer (SSL) APIs. For information about these APIs, see the Secure Sockets Layer (SSL) APIs topic under **Programming** in the iSeries Information Center.

Notes:

- This field ignored if the control connection security mechanism is 0 or the data connection encryption option is -1.
- Setting this field to a value other than 0 or the value specified in the control connection ciphersuite field may result in failure attempting to perform an SSL handshake between the FTP server and the FTP client, since the specified ciphersuite may not be supported by the FTP client.

TCPL0300 exit point format:
Exit Point Format Name: TCPL0300
Exit Point Name: QIBM_QTMF_SVR_LOGON
Exit Point Name: QIBM_QTMX_SVR_LOGON

This is the required parameter group:

1	**Application identifier**	**Input**	**Binary(4)**
2	User identifier	Input	Char(*)
3	Length of user identifier	Input	Binary(4)
4	Authentication string	Input	Char(*)
5	Length of authentication string	Input	Binary(4)
6	CCSID of authentication string	Input	Binary(4)
7	Client IP address	Input	Char(*)
8	Length of client IP address	Input	Binary(4)
9	Allow logon	Output	Binary(4)
10	User profile	Output	Char(10)
11	Password	Output	Char(*)
12	Length of password	Output	Binary(4)
13	CCSID of password	Output	Binary(4)
14	Initial current library	Input/Output	Char(10)
15	Initial home directory	Output	Char(*)
16	Length of initial home directory	Input/Output	Binary(4)
17	CCSID of initial home directory	Input/Output	Binary(4)
18	Application-specific information	Input/Output	Char(*)
19	Length of application-specific information	Input	Binary(4)

Parameter Descriptions

Application identifier
INPUT; BINARY(4) Identifies the application server from which the request is being made. The valid values are:

1
FTP server program

2
REXEC server program

User identifier
INPUT; CHAR(*) The user identification supplied by the client program.

For the FTP server, this parameter contains the data field from the USER subcommand.

Length of user identifier
INPUT; BINARY(4) The length (in bytes) of the user identifier string.

Authentication string
INPUT; CHAR(*) The string (such as a password) supplied by the client program.

For the FTP server, this parameter contains the data field from the PASS (password) subcommand (unless the user is authenticated via a client certificate, in which case the client certificate is provided for this parameter).

Length of authentication string
INPUT; BINARY(4) The length (in bytes) of the authentication string.

CCSID of authentication string
INPUT; BINARY(4) The CCSID of the authentication string parameter. For the FTP server: When the user is authenticated via a client certificate, this parameter is set to -2.

Client IP address
INPUT; CHAR(*) The Internet Protocol (IP) address from which the session originates. This string is in dotted decimal format, left justified.

Length of client IP address
INPUT; BINARY(4) Indicates the length (in bytes) of the client IP address.

Allow logon
OUTPUT; BINARY(4) Indicates whether the logon operation should be accepted or rejected, and how password authentication is performed. The valid values are:

0 Reject the logon operation. Ignores all other output parameters.

1 Continue the logon operation with the specified user identifier and authentication string. The user identifier is the user profile, and the authentication string is the password. The current library and working directory is based on the settings of those output parameters. The application ignores the user profile and password output parameters.

Note: For the logon to succeed, the authentication string must match the user profile-specified password.

2
Continue the logon operation. Override the user profile and password with the returned values in the output parameters of this exit program. The application initializes the current library and working directory based on the settings of those output parameters.

Note: For the logon to succeed, the password output parameter must match the user profile-specified password. ***Attention!*** IBM strongly recommends that you **never** code passwords directly in an exit program. Encryption, for example, allows algorithmic password determination.

3
Accept the logon operation. Override the user profile with the profile returned in the user profile output parameter of this exit program. The program initializes the current library and working directory based on the settings of the output parameters. It ignores the password output parameter.

Note: If your system is running at a security level of 20 or higher, specifying this value overrides normal OS/400 password processing. This is the only password authentication.

User profile
OUTPUT; CHAR(10) The user profile to use for this session. When required, this parameter must be left justified and padded with blanks.

Password
OUTPUT; CHAR(*) The password to use for this session. When required, the Length of password and CCSID of password parameters must also be specified, and this parameter must be left-justified. When the QPWDLVL system value is set to 0 or 1, up to 10 characters may be specified; when the QPWDLVL system value is set to 2 or 3, up to 128 characters may be specified.

Length of password
OUTPUT; BINARY(4) The length (in bytes) of the password. When required, the valid range is 1 to 512 bytes.

CCSID of password
OUTPUT; BINARY(4) The CCSID of the password. This parameter must be set by the exit program when the password parameter is specified. The valid values are:

0
The CCSID of the job is used to determine the CCSID of the data to be converted. If the job CCSID is 65535, the CCSID from the default CCSID (DFTCCSID) job attribute is used.

1-65533
A valid CCSID in this range.

Initial current library
OUTPUT; CHAR(10) The initial current library to use for this session. When required, this parameter must be left justified and padded with blanks. This parameter is set to the following special value when the exit program is called:*CURLIB- Use the current library that the user profile specifies.

Initial home directory
OUTPUT; CHAR(*) The initial setting of the home directory to use for this session. When specified,

this parameter must be a valid absolute path name, and the length of initial home directory and CCSID of initial home directory parameters set to the proper values.

Length of initial home directory
INPUT/OUTPUT; BINARY(4) The length of the initial home directory parameter returned by the exit program. This parameter initializes at zero when the application calls the exit program. If the exit program does not change the value of the parameter, the home directory is initialized to the home directory that the user's profile specifies.

CCSID of initial home directory OUTPUT; BINARY(4) The CCSID of the initial home directory. This parameter must be set by the exit program when the initial home directory is specified. The valid values are:

0
The CCSID of the job is used to determine the CCSID of the data to be converted. If the job CCSID is 65535, the CCSID from the default CCSID (DFTCCSID) job attribute is used.

1-65533
A valid CCSID in this range.

Application-specific information
INPUT/OUTPUT; CHAR(*) Information that is used to communicate application-specific logon settings. For the correct format, see Format of application-specific information parameter.

Length of application-specific information
INPUT; BINARY(4) The length (in bytes) of the application-specific information.

You may also need to refer to:

- Server logon exit point: You can control the authentication of users to a TCP/IP application server with this TCP/IP Application Server Logon Exit Point.

Remove exit programs

To remove an installed exit program:

1. Enter **WRKREGINF** at an iSeries command line.
2. Page down to an FTP Server Logon exit point:
```
QIBM_QTMF_SERVER_REQ  VLRQ0100
QIBM_QTMF_SVR_LOGON   TCPL0100
QIBM_QTMF_SVR_LOGON   TCPL0200
QIBM_QTMF_SVR_LOGON   TCPL0300
```
3. Enter **8** in the Opt field to the left of the exit point entry and press **Enter**.
4. At the **Work with Exit Program** display, enter a **4** (Remove).
5. Enter the name of the exit program in **Exit Program** field.
6. Enter the name of the library that contains the exit program in the Library field.
7. Press **Enter**.
8. After you finish removing exit points, stop and restart the FTP server.

Data transfer methods

Before you begin to transfer files, you must choose the appropriate file transfer type. You can use the default type, ASCII, or specify a different type. ASCII is the Internet standard for character encoding. EBCDIC is the standard for iSeries. Select the appropriate type according to the following:

- Use ASCII for transfers of files that only contain text (“text-only” files).
- Use EBCDIC to transfer EBCDIC data between systems that both support EBCDIC. This will avoid the need to convert data between EBCDIC and ASCII on both systems.

- Use BINARY for transfers of non-text files, such as binary numeric data, graphics files, and iSeries save files.

After you have chosen a file transfer format, you are ready to Transfer a file with FTP.

The following topics provide additional information about specific file types:

- Transfer files that contain packed decimal data between iSeries servers
- Transfer *SAVF files
- Transfer QDLS documents
- Transfer “root”, QOpenSys, and QLANSrv files
- Transfer files using QfileSvr.400
- Transfer Qsys.lib files
- File pre-creation considerations
- CCSID conversions

Transfer files that contain packed decimal data between iSeries servers

There is no support in FTP for converting special numeric formats like packed decimal or zoned decimal.

The transfer of packed decimal or zoned decimal data is supported between iSeries servers when you use either a transfer type of TYPE I (BINARY) or TYPE E (EBCDIC) with a transmission mode of BLOCK; these transfer types send the data as is without any conversion. The results of any other transfer type are unpredictable.

When transferring packed or zoned data in an externally-described QSYS.LIB file, the target file should be pre-created in the same manner as the source file. This restriction applies to data containing any special numeric format or when keyed access is required.

When transferring data with a transfer type of binary, the record length of the target file must be the same as the record length of the source file.

Before packed decimal or zoned decimal data can be transferred to or from other system architectures (such as S/390^R or UNIX), you must convert the data to printable form.

Transfer *SAVF files

*SAVF files must be sent as images and, therefore, require the FTP BINARY subcommand to be run before the GET or PUT subcommands.

When transferring a *SAVF file using name format 0, the save file on the receiving system must be pre-created. It is recommended that files are pre-created in other situations as well for reasons of performance and integrity.

The transfer of a save file—because it is a file format peculiar to iSeries—can only be made usable if the sending and receiving servers are both iSeries servers. However, a save file could be sent to a non-iSeries server and stored there for backup purposes. The save file could be transferred later to the iSeries with FTP.

Example: Transferring a *SAVF file from VM to an iSeries

The following example shows how to transfer a *SAVF file from VM to an iSeries for both NAMEFMT 0 and 1. The FTP session has already been initiated, the BINARY subcommand has been issued, and NAMEFMT 0 has been specified.

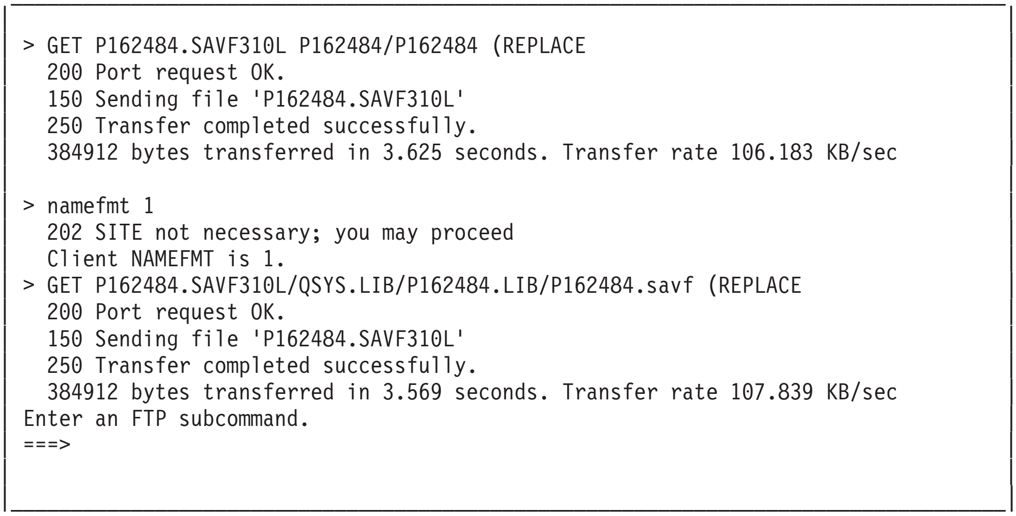
First, transfer the file P162484 SAVF310L from the VM A disk to the iSeries. VM FTP requires that you insert a period between its file name and file type. Give it the file name P162484 in library P162484 on the iSeries, and specify REPLACE as it has been pre-created even if it has not been used before. You will recall that pre-creation is mandatory with NAMEFMT 0.

Change the NAMEFMT to 1, and repeat the file transfer using the new name format. Once again, specify REPLACE, since the file exists from the previous step.

Notes:

- If you had not pre-created the file on the iSeries before performing the transfer with NAMEFMT 0, the transfer would have appeared to have completed satisfactorily. However, on inspection of the file on the iSeries, it would be seen that a physical file (*PF) has been created and not a save file (*SAVF).
- Some preprocessing may be necessary on the VM system depending on how the *SAVF file was sent to VM:
  - If FTP was used to send the *SAVF file to VM, you can just issue a GET subcommand to transfer it back to the iSeries.
  - If the Send Network File (SNDNETF) command was used to send the *SAVF file to VM, it is first necessary to convert the file on the VM system from a record format (RECFM) of variable to a RECFM of fixed before using FTP to transfer it back to the iSeries server. To do this, use the COPYFILE command on VM. For example:

    ```
    COPYFILE P162484 SAVF310L A = = = (RECFM F RE
    ```



```
> GET P162484.SAVF310L P162484/P162484 (REPLACE
  200 Port request OK.
  150 Sending file 'P162484.SAVF310L'
  250 Transfer completed successfully.
  384912 bytes transferred in 3.625 seconds. Transfer rate 106.183 KB/sec

> namefmt 1
  202 SITE not necessary; you may proceed
  Client NAMEFMT is 1.
> GET P162484.SAVF310L/QSYS.LIB/P162484.LIB/P162484.savf (REPLACE
  200 Port request OK.
  150 Sending file 'P162484.SAVF310L'
  250 Transfer completed successfully.
  384912 bytes transferred in 3.569 seconds. Transfer rate 107.839 KB/sec
Enter an FTP subcommand.
===>
```

Figure 1. Transferring a *SAVF from VM to iSeries using NAMEFMT 0 and NAMEFMT 1 .
«

Transfer QDLS documents

» When a QDLS document is transferred, The QDLS directory entry attribute that indicates the type of document is defaulted to the document type PCFILE on the receiving iSeries server for all document types except revisable-form text (RFT) documents. RFT documents are defaulted to the document type RFTDCA. RFTDCA type documents can be viewed and edited using the WRKDOC CL command. PCFILE type documents cannot be viewed or edited using the WRKDOC CL command. «

Transfer “root”, QOpenSys, QLANSrv, QDLS, and QOPT files

You must use stream mode (MODE S) and file structure (STRUCT F) when transferring files in the “root”, QOpenSys, QLANSrv, QDLS, and QOPT file systems.

“root”, QOpenSys, QDLS, and QOPT files can exist in any valid code page. Files transferred to the QLANSrv file system are tagged with the code page defined for the network server description corresponding to the directory containing that file.

Data conversion and CCSID assignments vary depending on the transfer TYPE used. You may want to refer to CCSID code page tagging for iSeries files. TYPE E is not supported for the QLANSrv file system.

When appending data to an existing file, the CCSID tag of that file is not changed. When appending data to an existing file using TYPE A, the data is converted to the code page of that file.

Transfer files using QfileSvr.400

The QFileSvr.400 file system provides access to other file systems on remote iSeries servers. The transfer of files in the “root”, QOpenSys, QLANSrv, QDLS, and QOPT file systems is supported. The transfer of files in the QSYS.LIB file systems is not supported.

You must use stream mode (MODE S) and file structure (STRUCT F). For example, in Figure 9-30 (See 126), FILE.ABC is transferred to and from three different files systems on system AS012 using the QFileSvr.400 file system on system AS009.

After connecting to system AS009, the FTP client subcommands shown in Figure 9-31 (See 126) perform the data transfers.

Note: The userid and password on systems AS009 and AS012 must be the same.

```
 ___________________________________________________________________________
|                                                                           |
|                                                                           |
|      Client                     System                 System             |
|      System                      AS009                  AS012             |
|     _________                  _________              _________           |
|    |         |                |         |            |         |          |
|    |         |      PUT       |         |            |  root,  |          |
|    |         |--------------->|         |            |QOpenSys,|          |
|    |         |                |QFileSvr.|<---------->|   and   |          |
|    |         |      GET       |   400   |            | QLanSrv |          |
|    |         |<---------------|         |            |  file   |          |
|    |         |                |         |            | systems |          |
|    |         |                |         |            |         |          |
|    |_________|                |_________|            |_________|          |
|                                                                           |
|                                                                           |
|___________________________________________________________________________|
```

Figure 9-30. QFileSvr.400 File System Example

```
 ___________________________________________________________________________
|                                                                           |
|                                                                           |
|   NAMEFMT  1                                                              |
|   LCD  /CLIENTDIR1                                                        |
|   CD  /QFileSvr.400/AS012/FLSDIR                                          |
|   PUT  FILE.ABC                                                           |
|   GET  FILE.ABC  /CLIENTDIR2/FILE.ABC                                     |
|   CD  /QFileSvr.400/AS012/QOpenSys/FLSDIR                                 |
|   PUT  FILE.ABC                                                           |
|   GET  FILE.ABC   /CLIENTDIR2/FILE.ABC (REPLACE                           |
|   CD  /QFileSvr.400/AS012/QLANSrv/NWS/LANSRV/DSK/K/FLSDIR                 |
PUT  FILE.ABC
GET  FILE.ABC  /CLIENTDIR2/FILE.ABC (REPLACE
SYSCMD  RMVLNK  '/CLIENTDIR2/FILE.ABC'
DELETE  /QFileSvr.400/AS012/FLSDIR/FILE.ABC
DELETE  /QFileSvr.400/AS012/QOpenSys/FLSDIR/FILE.ABC
DELETE  /QFileSvr.400/AS012/QLANSrv/NWS/LANSRV/DSK/K/FLSDIR/FILE.ABC
QUIT
```

Figure 9-31. Subcommands to Transfer Files Using QFileSvr.400

Transfer QSYS.LIB files

Table 1 and Table 2 below summarize FTP operations in stream transfer mode and in image transfer type for the QSYS.LIB file system. Keep the following in mind when using these tables:

Compatible record length and file size

When you send data to a file that already exists, the record and file size of the receiving file must be compatible with the file being sent or a transfer error will occur. Both the record and file size of the receiving file must be greater than or equal to the source file record and file size. To determine if the existing file size is compatible you need to consider the current number of records, the number of extensions allowed, and the maximum record size allowed. You can view this information by entering the iSeries Display File Description (DSPFD) command.

Automatic file creation on the iSeries server

When receiving a file, the iSeries server automatically creates a physical file, if one does not already exist. However, it is recommended that you pre-create the file on the iSeries.

Data type

When transferring data using TYPE I, the data is not converted. If the file does not exist, it is tagged with CCSID 65535 when it is created.

Note: File pre-creation is advised when using the MGET and MPUT subcommands to transfer files with multiple members. When a file is not pre-created, FTP creates a file with a maximum record length equal to the longest record of the first member processed. If the record length of any other file member is longer, a data truncation error will occur when transferring that member. Pre-creating a file with a record size to accommodate all members will prevent this error

Table 1: Stream Transfer Mode for QSYS.LIB File System

Library Exists	File Exists	Member Exists	Replace Selected	Compatible Record Length	Compatible File Size	Result
Yes	Yes	Yes	Yes	Yes	Yes	Data written to member.
Yes	Yes	Yes	No	N/A	N/A	Transfer rejected and message sent.

Library Exists	File Exists	Member Exists	Replace Selected	Compatible Record Length	Compatible File Size	Result
Yes	Yes	No	N/A	No	Yes	File transfer completed, records truncated, and message returned.
Yes	Yes	No	Yes	No	Yes	File transfer completed, records truncated, and message returned.
Yes	Yes	No	N/A	Yes	Yes	Member created and data written to it.
Yes	Yes	No	No	N/A	No	Transfer rejected and message sent.
Yes	No	N/A	N/A	N/A	N/A	File created with record length equal to the maximum record length of the incoming file. Member created and data written to member.
No	N/A	N/A	N/A	N/A	N/A	Transfer rejected and message sent. Use the CRTLIB command to create a library on the remote iSeries server.

Table 2: Image Transfer Type for QSYS.LIB File System

Library Exists	File Exists	Member Exists	Replace Selected	Result
Yes	Yes	Yes	Yes	Data written to member.
Yes	Yes	Yes	No	Transfer rejected and message sent.
Yes	Yes	No	N/A	Member created and data
Yes	No	N/A	N/A	
No	N/A	N/A	N/A	

Receive text files to QSYS.LIB: Because the iSeries QSYS.LIB file system internally supports a record structure, the iSeries FTP converts files received on the iSeries server into a record structure and converts files sent from the iSeries server into the FTP file structure. Text files received on the iSeries server by FTP are converted into a record structure in the following manner:

- When FTP receives a file and that file already exists on the iSeries server, the record length of the existing file is used.
- When FTP creates a new file on the iSeries server, it uses the length (excluding trailing spaces) of the longest line or record in the file as the record length of the file.

Text files sent from the iSeries server by FTP are converted into a file structure by removing the trailing blanks from each line or record and sending the truncated record.

File pre-creation considerations

It is strongly recommended that you pre-create any files that are to be transferred into the iSeries QSYS.LIB file system. This is the best method of ensuring that your data is transferred reliably and effectively with optimal performance and integrity.

Be sure to allocate enough records to accommodate the entire file. On the iSeries this is done in the SIZE parameter of the Create Physical File (CRTPF) command.

Ensure that the RCDLEN parameter of the Create Physical File (CRTPF) command is adequate to accommodate the maximum record length expected.

Note: You can pre-create files on the FTP server system using the QUOTE subcommand. You can pre-create files on the FTP client system using the SYSCMD subcommand.

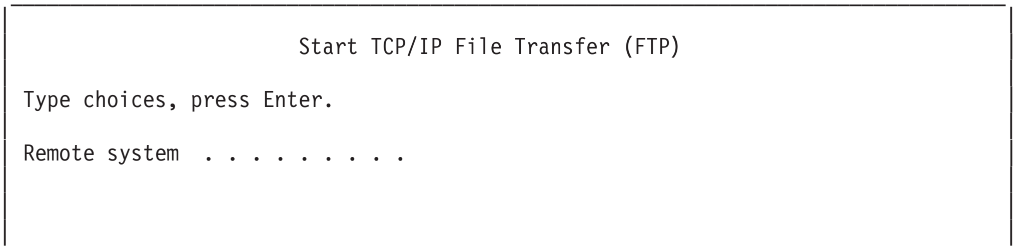
CCSID conversions

iSeries uses Coded Character Set Identifier (CCSID) information to interpret the input data and provide the output data in the proper format for display. The input could be ASCII or EBCDIC. The following topics provide detailed information about CCSID conversions:

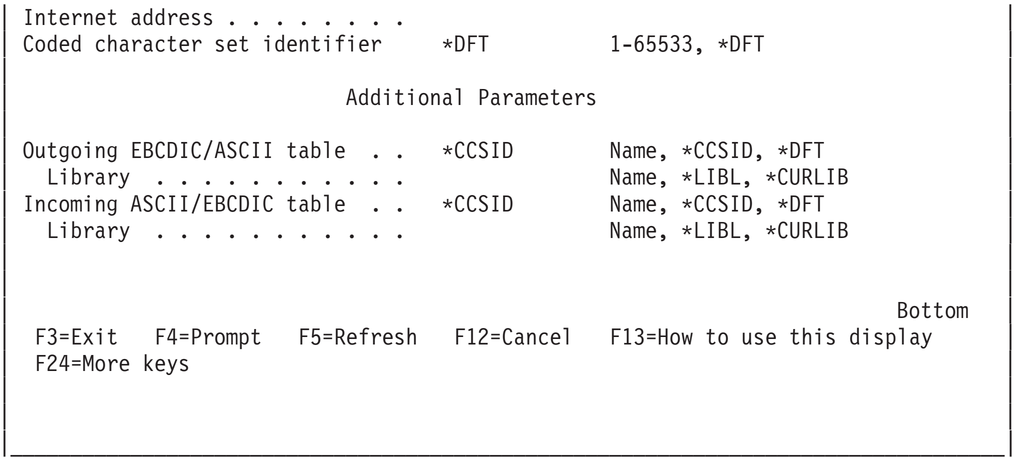
- Specify mapping tables
- CCSID code page tagging for iSeries files
- NLS considerations for FTP

Specify mapping tables: For FTP client, the ASCII mapping tables are specified in the FTP command. For FTP server this is done in the Change FTP Attributes (CHGFTPA) command. To specify the FTP client mapping tables:

1. Enter the command `FTP`.
2. Press **PF4**. The **Start TCP/IP FTP** display is shown.
3. Press **F10**. The prompts for outgoing and incoming ASCII/EBCDIC tables are displayed.



```
                     Start TCP/IP File Transfer (FTP)

Type choices, press Enter.

Remote system  . . . . . . . . .
```



```
Internet address . . . . . . . .
Coded character set identifier     *DFT          1-65533, *DFT

                           Additional Parameters

Outgoing EBCDIC/ASCII table  . .   *CCSID        Name, *CCSID, *DFT
  Library  . . . . . . . . . . .                 Name, *LIBL, *CURLIB
Incoming ASCII/EBCDIC table  . .   *CCSID        Name, *CCSID, *DFT
  Library  . . . . . . . . . . .                 Name, *LIBL, *CURLIB


                                                                Bottom
 F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
 F24=More keys
```

Figure 1. Specifying ASCII Mapping Tables with the *CCSID Value

Specify the CCSID (and hence the mapping tables) to be used for the FTP client. When the *DFT value is not changed, the CCSID value 00819 (ISO 8859-1 8 bit ASCII) is used. You may also specify a specific CCSID for both inbound and outbound transfers. The use of CCSIDs is discussed in National Language Support considerations for FTP.

Notes:

- Double-byte character set (DBCS) CCSID values are not permitted for the CCSID parameter on the CHGFTPA command. The DBCS CCSID values can be specified using the TYPE (Specify File Transfer Type) subcommand.
- IBM includes mapping support in FTP to ensure compatibility with releases prior to V3R1. Use of mapping tables for incoming TYPE A file transfers results in the loss of CCSID tagging if the target file must be created. IBM strongly recommends that you use CCSID support for normal operations.

«

CCSID code page tagging for iSeries files: » When FTP creates a new file on an iSeries server, it is tagged with a CCSID or the code page of that CCSID to identify the character data in that file. When replacing or appending data to an existing file, the tag of the file is not changed. The table below summarizes how FTP assigns these values for different file systems and transfer types.

Table 1: CCSID Code Page Tagging for iSeries Files

Receiving File System	Transfer Type A (ASCII)	Transfer Transfer Type C ('ccsid')	Transfer Type E (EBCDIC)	Transfer Type I (Image/Binary)
QSYS.LIB	CCSID specified by the EBCDIC coded character set identifier for new database files (CRTCCSID) setting.	'ccsid' if EBCDIC CCSID. If ccsid is ASCII, then related default EBCDIC CCSID.	65535	65535
"root", QOpenSys, QDLS, QOPT	Default ASCII CCSID.	'ccsid' value specified in TYPE C ccsid# subcommand.	Job CCSID if it is not 65535. If Job CCSID is 65535, assign Default Job CCSID.	Default ASCII CCSID.

Receiving File System	Transfer Type A (ASCII)	Transfer Transfer Type C ('ccsid')	Transfer Type E (EBCDIC)	Transfer Type I (Image/Binary)
QLanSrv	ASCII code page of the network server description for file directory.	ASCII code page of the network server description for file directory.	Not supported.	ASCII code page of the network server description for file directory.

Note: The default ASCII CCSID is defined when the FTP job is started: For the client, the CCSID parameter of the STRTCPFTP (and FTP) command. For the server, the CCSID parameter of the FTP Configuration attributes which can be changed using the CHGFTPA command. QFileSvr.400 file assignments depend on the file system receiving the file.

NLS considerations for FTP: Be aware of the following when using FTP in an environment with different primary languages.

- When data is transferred using TYPE E (or EBCDIC) the data is stored as is and therefore will be in the EBCDIC code page of the file that it came from. This can result in the stored file being tagged with an inappropriate CCSID value when the primary language of the two iSeries servers is different.

  For example, when data in code page 237 is sent using TYPE E to the QSYS.LIB file system on a machine where the file does not exist, the data is stored as is in a new file tagged with CCSID 65535. If the receiving file already exists, then the data will be received as is and tagged with the existing file CCSID which may not be 237.

  To avoid incorrect CCSID tagging, you can use the TYPE C CCSID subcommand (for example, TYPE C 237) to specify the CCSID of the data being transferred. When a CCSID is specified on a transfer and the data is written to an existing file, the data is converted to the CCSID of the existing file. If no target file exists before the transfer, a file is created and tagged with the specified CCSID.

  In the preceding example, if the target file does not exist, a file with a CCSID of 237 is created on the receiving system. When the target file already exists, the data is converted from CCSID 237 to the CCSID of the target file.

- When starting the FTP client, message TCP3C14: `Unable to convert data from CCSID &1 to CCSID &2`, may be displayed. This occurs if no character conversion is available between the EBCDIC CCSID specified by your job and the ASCII CCSID specified for the this FTP session.

  You can change the ASCII CCSID by specifying a value for the coded character set identifier parameter of the STRTCPFTP CL command. CCSID 850, which contains the IBM Personal Computer Latin-1 coded character set, is an ASCII CCSID for which character conversions are available to all valid job CCSID values.

- When using FTP in ASCII mode between two EBCDIC systems, the data on the system sending the file is converted from its stored EBCDIC code page to ASCII, and then from ASCII to the EBCDIC code page of the receiving system. Usually this does not present a problem because the 7-bit ASCII code page used by the two systems is the same unless the EBCDIC characters on the sending system are not defined in the ASCII code page. Also, some characters in the ASCII code page may be mapped differently between the two different EBCDIC code pages. This might occur if some of the ASCII characters are variant (the character occupies a different hexadecimal code point in an EBCDIC code page). The variant character may be interpreted differently on the receiving system if the EBCDIC code page is different from that of the system sending the file.

File systems and naming conventions

The FTP server arranges the information units of a file system in a multiple-level tree-like structure.

The OS/400 file systems that are supported by FTP vary depending on the release level of your iSeries server. File systems on OS/400 can use different terms for data and the hierarchical grouping of data.

Naming conventions

Each OS/400 file system has its own set of rules for naming files. The format used to name any file must adhere to the naming conventions of the file system in which it resides. Formats and examples of file names for FTP-supported OS/400 file systems are described in IFS. Refer to the File Systems and Management topic for more information. The server may provide naming information for files on non-iSeries servers when you use QUOTE HELP.

FTP server NAMEFMT

When an FTP server session is started, NAMEFMT is set to “0”. You can change the NAMEFMT value by using the SITE subcommand.

The server automatically switches from the default of NAMEFMT 0 to NAMEFMT 1 when the ’first’ file or pathname parameter received in a subcommand either:

- Starts with a slash (/) or a tilde (~) character
  or
- Is blank (except for the LIST and NLST subcommands)

Any subsequent server subcommands with a file or path name parameter will not affect the NAMEFMT value. In addition to changing the NAMEFMT, the server reply for the subcommand will include a statement saying that the NAMEFMT value has been changed.

For example, the server NAMEFMT value will be changed to “1” if the first server subcommand with a file or path name is:

```
CWD  /DIR1/DIR2A
```

The server reply will be:

```
250-NAMEFMT set to 1.
250 Current directory changed to /DIR1/DIR2A.
```

Note: This capability enables the typical Web browser, which requires NAMEFMT 1, to interact with iSeries FTP servers without issuing a SITE NAMEFMT 1 subcommand.

For additional information on NAMEFMT, refer to File systems and naming conventions.

See the NAMEFMT (Select File Naming Format) client subcommand page for instructions on the use of the NAMEFMT subcommand to work with file name formats.

OS/400 file systems that are supported by FTP

The file systems supported by FTP vary depending on the release level of your iSeries server.

QSYS.LIB Library file system - libraries, files, members
FTP supports the transfer of save files and members in physical files, logical files, DDM files, and source physical files. For QSYS.LIB file system physical files, the data transferred is a member of a file which resides in a library.

QDLS Document library services - folders and documents
For the Document Library Services (QDLS) file system the data transferred is a document. QDLS documents reside in directories called folders.

“root”
The / file system. This file system takes full advantage of the stream file support and hierarchical directory structure of the integrated file system. It has the characteristics of the DOS and OS/2^{R} file systems.

QOpenSys
The open systems file system. This file system is compatible with UNIX-based open system standards, such as POSIX and XPG. Like the root file system, it takes advantage of stream file and directory support that are provided by the integrated file system. It supports case-sensitive names.

QOPT
The QOPT optical file system. This file system provides access to stream data that is stored on optical media.

QFileSvr.400
The OS/400 file server file system. This file system provides access to other file systems that reside on remote iSeries servers. FTP does not support access to QSYS.LIB, QDLS, and QOPT that uses QFileSvr.400.

For comprehensive information on the file systems that FTP supports, see Integrated File System.

FTP server reply status messages

When you enter subcommands during an FTP client session, status messages return to your display in a 3-digit code: *xyz*.

The first digit (x) tells you whether the response is good, bad, or incomplete. There are five values for the first digit:

- 1yz = Good. The requested action is being initiated; another reply should follow.
- 2yz = Good. The requested action was successfully completed; a new request may be initiated.
- 3yz = Incomplete. The subcommand was accepted, but the requested action is being held pending receipt of more information.
- 4yz = Incomplete. The server did not accept the subcommand. The requested action did not take place; the error is temporary and you can request the action again.
- 5yz = Bad. The subcommand was not accepted, and the requested action did not take place.

The second digit (y) tells you the functional category of the response.

- x0z=Syntax. Refers to syntax errors, commands that aren’t appropriate for what you’re trying to do, and unnecessary commands.
- x1z=Information. Refers to requests for information, such as status or help.
- x2z=Connections. Refers to the control or data connections.
- x3z=Authentication. Refers to the login process.
- x5z=File system. Refers to the status of the server in relation to the file transfer request.

The third digit (z) tells you a finer level of detail about the functional category.

Common reply codes and what they indicate are below. The message text may vary for different server systems.

Code	What It Means
110	Restart the marker reply
120	Service is ready in nnn minutes
125	Data connection is already open; transfer is starting
150	File starting OK; about to open the data connection
200	Command OK
202	Command was not implemented; it is not used on this system
211	System status, or system help reply
212	Directory status
213	File status
214	Help message
220	Service is ready for a new user
226	Closing the data connection; the requested file action was successful
230	User is logged in
250	Requested file action was okay; action is completed
257	Path name was created
331	Password is required
332	Account is required
425	Cannot open the data connection
426	Connection is closed; the transfer ended abnormally
450	Requested file action was not taken; file busy
451	Requested action ended abnormally; local error in processing
452	Requested action was not taken; insufficient storage exists in system
500	Syntax error; command was unrecognized
501	Syntax error in the parameters or arguments
502	Command was not implemented
503	Bad sequence of commands
504	Command was not implemented for that parameter
530	Logon attempt was rejected
532	Need an account for storing files
550	Requested action was not taken; the file was not found (or no access)
551	Requested action ended abnormally; the page type is unknown
552	Requested file action ended abnormally; storage allocation was exceeded
553	Requested action was not taken; the file name is not allowed

FTP server syntax conventions

The FTP server subcommands described in this topic make use of these syntax conventions:

Uppercase Letters
You must enter letters in uppercase exactly as shown in the syntax definitions for subcommands. You can enter these letters in either uppercase or lowercase.

Lowercase Words or Hyphenated Terms
Lowercase words or hyphenated terms, such as (remotefile and account-information,) represent variables for which you must substitute specific information.

Brackets [ ]
You can consider words, symbols, or phrases placed within brackets to be optional.

Left Parentheses (and Asterisks *
You must enter left parentheses and asterisks exactly as shown in the syntax definitions.

Braces { }
Braces indicate a group of parameters, values, or variables that you can repeat.

Ellipsis ...
Ellipses indicate that you can include zero or more repetitions of the preceding variable enclosed within brackets.

Vertical Bar |
A vertical bar between parameters or values indicates that you can specify one or the other, but not both, at one time. You will see the vertical bars placed within sets of brackets or braces.

FTP client syntax conventions

The FTP client subcommands described in this topic make use of these syntax conventions:

Uppercase Letters
Letters printed in uppercase in the syntax definitions for client subcommands are the minimum number of letters that you must enter. You can enter FTP client subcommands in either uppercase or lowercase.

Lowercase Words or Hyphenated Terms
Lowercase words or hyphenated terms, like remotefile and account-information, represent variables that you must substitute specific information.

Brackets[ ]
You can consider words, symbols, or phrases placed within brackets to be optional.

Left Parentheses (and Asterisks *
You must enter left parentheses and asterisks exactly as they appear n in the syntax definitions.

Braces { }
Braces indicate a group of parameters, values, or variables that you may repeat.

Ellipsis ...
Ellipses indicate that you can include zero or more repetitions of the preceding variable enclosed within brackets.

Vertical Bar |
A vertical bar between parameters or values indicates that you can specify one or the other, but not both, at one time. The vertical bars are within sets of brackets or braces.

More details on syntax:

- Enclosing subcommand parameters: Link to this information on how to use either an apostrophe (') or quotation marks (") to enclose parameters.
- Default file names for client transfer subcommands: Link to this information for details on the default values.
- Naming files for transfer: Link to this information for details on the Localfile and Remotefile parameters.

Enclose subcommand parameters

You can use either an apostrophe (') or quotation marks (") to enclose subcommand parameters. To enclose an apostrophe within a parameter, you must enter it either as two consecutive apostrophes ('') in a parameter that is enclosed by apostrophes. You must enter it as a single apostrophe in a parameter that is enclosed by quotation marks (").

Similarly, if a quotation mark (") is to be contained within a parameter, you must enter it in one of these ways:

- A single quotation mark (") in a parameter that is enclosed by apostrophes
- As two consecutive quotation marks ("") in a parameter that is enclosed by quotation marks.

You can use the apostrophe or quotation marks as follows:

1. If the apostrophe or quotation marks within the parameter are the same as the starting and ending delimiter, you must repeat the mark within the parameter. For example:
```
'ABCD'12345'
   results in   ABCD'12345
"ABCD""12345"
   results in   ABCD"12345
```
2. If the starting and ending marks are not the same as the mark within the parameter, you do not repeat the mark. For example:
```
"ABCD'12345"
   results in  ABCD'12345
'ABCD"12345'
   results in  ABCD"12345
```
3. If both the apostrophe and quotation marks are within the parameter, you must choose one mark symbol as the delimiter. For example:
```
"ABC'12""345"  or  'ABC'12"345'
   results in   ABC'12"345
```

More details on syntax:

- FTP client syntax conventions

File names for client transfer subcommands

The FTP client provides a default file name if the target file name for the PUT, APPEND, and GET subcommands is omitted. Since you can specify source file names for the MPUT andMGET subcommands, the FTP server also generates target file names for MPUT and MGET. See the Data Transfer Subcommands table below for the syntax of these subcommands. The table column labeled *Target* is the parameter for which a default name is provided.

Subcommand	Source	Target	Other
APPEND	local filename	[server filename]	
PUT	local filename	[server filename]	
GET	server filename	[local file name]	[(Replace]

Subcommand	Source	Target	Other
MPUT	local filename		
MGET	server filename		[(Replace]

PUT and APPEND

For the PUT and APPEND subcommands, the rules for forming default names are divided into two categories:

- iSeries server case
  - – If the target file system is a library file system or a document library system, the default name complies with the naming rules for these systems, including their name format.
  - – If the target file system is neither a library file system nor a document file system it is one of two names:
    - the default name is the name after the last slash in the source file name
    - the *same* as the source file name if there is no slash.
- Non-iSeries server case
  - – If the source file is a library file system file, then the default name consists of the *file name.member name*. If there is no member name, the file name is the default name.
  - – If the source file is a document library services file, the default name is the file name and the extension.
  - – If the source file is neither a library file system nor a document library services file, the name after the last slash in the source name is the default name. If there is no slash, the default name is the same as the source name.

If the server is an iSeries server, then the server generates the default name in these subcommands using the same rules as applied for the PUT subcommand.

GET and MGET

If the server is not an iSeries server, it bases the default name for the GET and MGET subcommands on the part of the source name that follows the last slash. If there is no slash, the entire source name is the default name. Here are the rules for forming default names:

- If the client file system is the *library file system* (iSeries database), these rules apply:
  - – If the remote file name contains a period (.), the characters preceding the period are truncated to 10 characters to form the local file name. The characters after the period are truncated to 10 characters to form the member name.
  - – If the remote file name does not contain a period, both file and member names are set to the remote file name truncated to 10 characters to form the local file name.
  - – If the name format is 1, the server adds the appropriate extensions to the file and member parts of the name.
- If the client file system is *document library services*, these rules apply:
  - – If the remote name contains a period, the characters preceding the period are truncated to 8 characters. The characters after the period are truncated to 3 characters.
  - – If the remote name does not contain a period, the name is truncated to 8 characters without an extension.
- For other file systems, the name after the last slash in the remote name is the default name.

Notes:

1. Save files do not have members, so default names for save files do not have a member part.
2. The server displays the default names when the DEBUG mode is on.

More details on syntax:

- FTP client syntax conventions

Naming files for transfer

The FTP client subcommands that you use for transferring data can have a **localfile** or a **remotefile** parameter or both. You can use these parameters to name the data you want to transfer. The transfer subcommands are:

APPEND
localfile [remotefile]

DELETE
remotefile

GET
remotefile [localfile]

MDELETE
remotefiles

MGET
remotefiles

MPUT
localfiles

PUT
localfile [remotefile]

The names for the localfile and remotefile parameters can be either partially qualified or fully qualified. A partially-qualified name includes the name of the data itself as well as one or more names in the hierarchical sequence above the data. A fully-qualified name includes all names in the hierarchical sequence above the data.

When the name is partially qualified, the current working directory identifies the file to be processed. You can set the working directory on the local client system with the LCD subcommand. You can set the working directory on the remote server system with the CD subcommand.

The format of the localfile name parameters must conform to iSeries file naming rules. The remotefile names must adhere to the file naming rules of the remote system.

More details on syntax:

- Enclosing subcommand parameters: You can use either an apostrophe (’) or quotation marks (“) to enclose parameters.
- Default file names for client transfer subcommands: Link to this information about default file names for client transfer subcommands.
- FTP client syntax conventions: FTP client subcommands make use of these syntax conventions.

Troubleshoot FTP

This topic provides basic troubleshooting information for FTP.

Determine problems with FTP
View a list of steps to determine whether your SMTP is working correctly.

Materials required for reporting FTP problems
This topic describes what information your service representative may require.

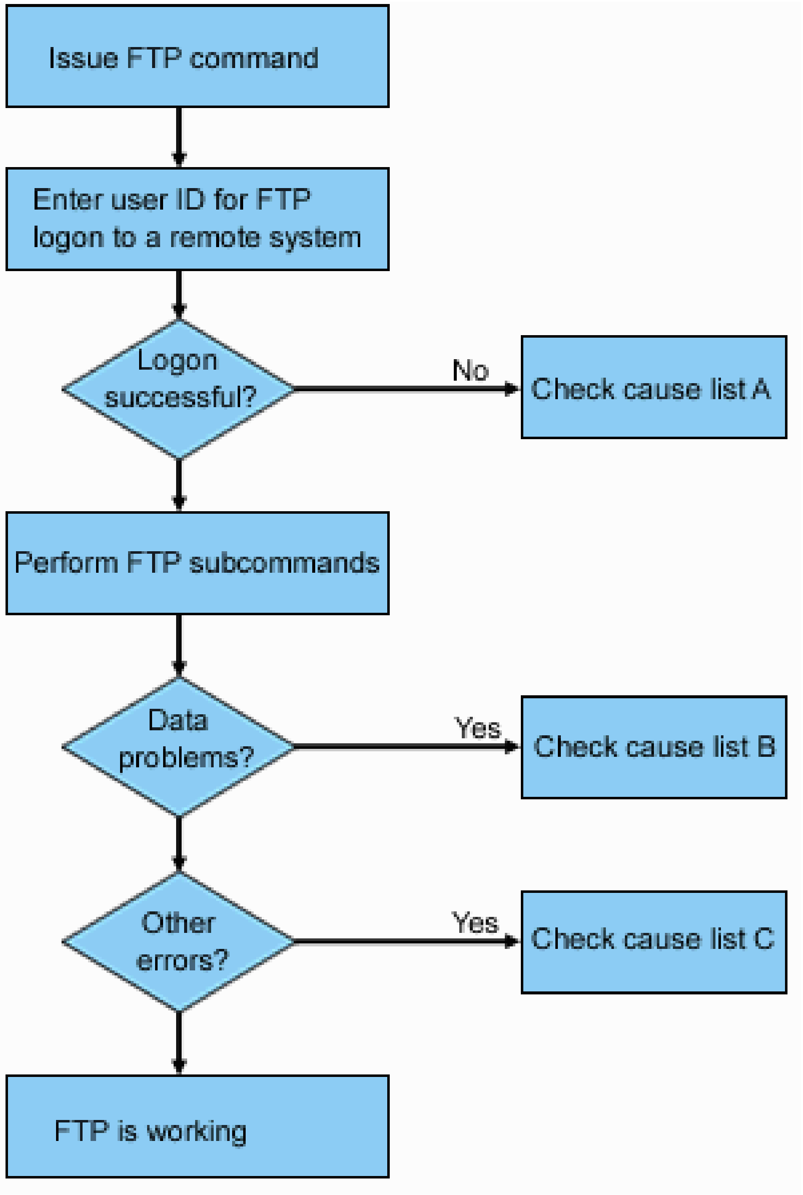
Trace the FTP server
Use the DBUG subcommand to track down problems on the FTP server.

Trace the FTP clients
Use the DEBUG subcommand to track down problems on the FTP client.

Work with FTP server job log
Obtain a spooled file of the FTP server job log to research errors.

Determine problems with FTP

If you detect a problem when using FTP, use the following flow chart to identify the cause after using the flow chart for general TCP/IP problems. The cause lists that follow list steps to help you identify the cause of the problem.



*

FTP Problem Analysis

Cause List A

1. Is there is a long delay between connecting to the iSeries FTP server and receiving a prompt for a user id? If so, check the configuration of the domain name server on your iSeries. The FTP server performs a DNS query as soon as a new connection is received. DNS problems may cause the server to hang for several minutes before a response is received.
2. Check to see if an exit program has been added to the FTP Server Logon Exit Point. Refer to the Server logon exit point subtopic. If yes, then check if the logon that is unsuccessful is allowed by the exit program.
3. Check to see if the remote logon requires a password if a password was requested. Some systems request a password, but the connection can fail because it is not required.
4. Set up a password on the remote system if required. You may have to restart if you change the security information on the system.
5. Check your user ID and password by attempting to sign on to your remote system. If you are unable to do so, contact the system owner to verify that your user ID and password are correct.

Cause List B

1. Make sure binary mode is in effect if you are transferring binary files.
2. Check to be sure the mapping tables on both the client and server systems are compatible. You need only do this if you are using your own mapping tables.
3. Check to see that the correct CCSID has been specified for the transfer. If not, use the TYPE or LTYPE subcommand to set the correct CCSID value before the transfer is performed.
4. Create a file on the system that you are planning to store data into. Set the proper record length, number of members, and number of increments. Try the data transfer again and verify that it was successful.
5. Make sure that you are authorized to use the file and the file members.
6. Check to see if the transfer file contains packed decimal or zoned decimal data.
7. If you are transferring a Save file, verify that the appropriate method was used.

Cause List C

1. Check file size limits on the remote system.
2. Check to see if the FTP server timer ended. The iSeries server time-out value can be set using the QUOTE TIME command.
3. Use the NETSTAT command to verify that the *LOOPBACK interface is active. Then re-create the problem doing FTP LOOPBACK (iSeries-to-iSeries internally).
   - If the problem cannot be recreated, it is probably a remote system problem.
   - If you can re-create the problem, do the following:
     a. If the problem is an FTP server problem, then start the FTP server trace using the TRCTCPAPP command.
     b. Create the problem again.
     c. End the FTP connection. Refer to the Starting and stopping the FTP server.
     d. End the FTP server trace using the TRCTCPAPP command.
     e. Find a spooled file with the following characteristics:
        – The file name is QTMFFTRC
        – The username associated with the file is the name of the user who issued the TRCTCPAPP command.

        The trace is a spooled file in the default output queue of the system associated with the FTP server job.
     f. Send in that spooled file.
     g. If the problem was on the iSeries FTP client, a trace can be obtained using the DEBUG 100 client subcommand.
     h. When running the FTP client interactively, use the F6 (Print) key to create a spool file that contains a history of the FTP client subcommands entered, and the associated FTP server replies. When the FTP client is run in batch unattended mode, then this history of subcommands and server replies is written to the specified OUTPUT file. For more details, see “FTP as Batch Job”.

Materials required for reporting FTP problems

Any FTP problem reported to IBM should include the following:

- A communications trace from the time of the failure (Request TCP/IP data only) formatted twice: once for ASCII and once for EBCDIC.

- If the FTP client or server has logged software error data, submit the data.

Note: The system value QSFWERRLOG must be set to *LOG for software error logging to take place. If an error occurs while QSFWERRLOG is set to *NOLOG, change the value to *LOG, try to re-create the error, and submit the logged software error data. If logged software error data is submitted, there is no need to perform a trace of FTP.

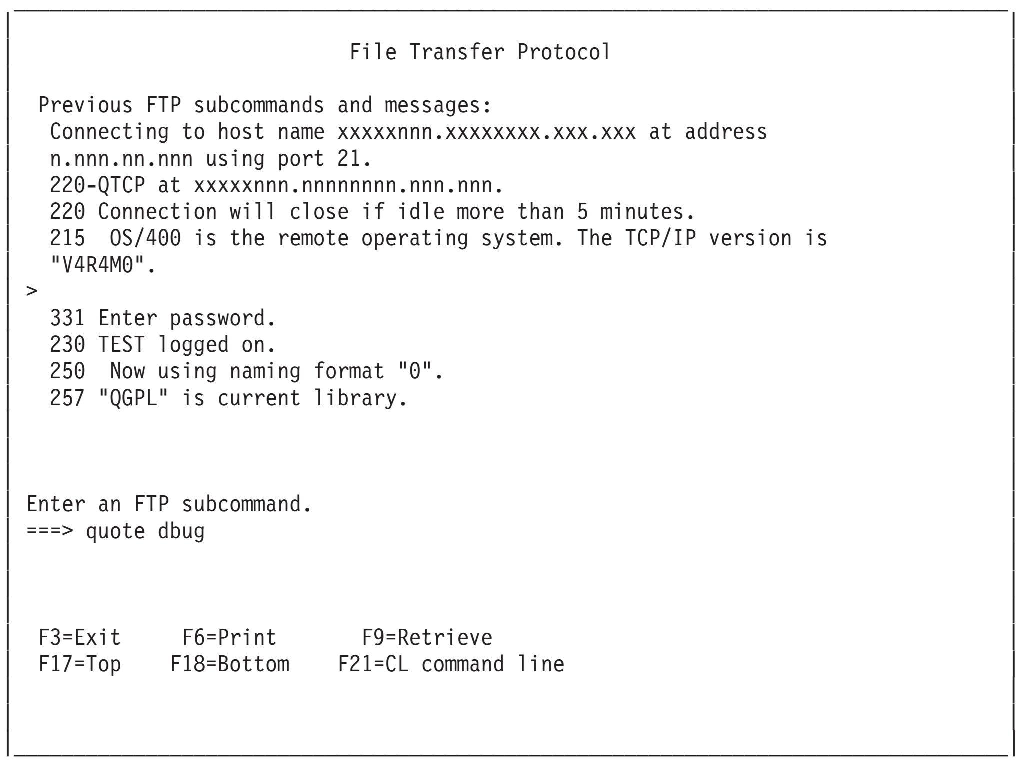
- The QTCPIP and any FTP server or FTP client job logs.
- The FTP client and FTP server debug traces.
- For FTP client problems, a spool file containing the FTP client session (which may be obtained by hitting the print (F6) key in the FTP session).
- If data integrity is the problem, then the file, member, or library causing the problem should be sent in along with a copy of the description of the file, member, or library.

Trace the FTP server

The FTP server can be traced from any iSeries or non-iSeries server that runs TCP/IP. There are two ways to trace the FTP server. The FTP server DBUG subcommand traces within an FTP server session. The Trace TCP/IP Application (TRCTCPAPP) command allows system wide tracing of all the FTP servers.

Tracing the FTP server with the DBUG subcommand

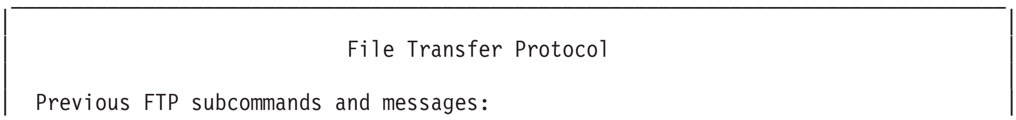
The following is an example using the FTP server DBUG subcommand:



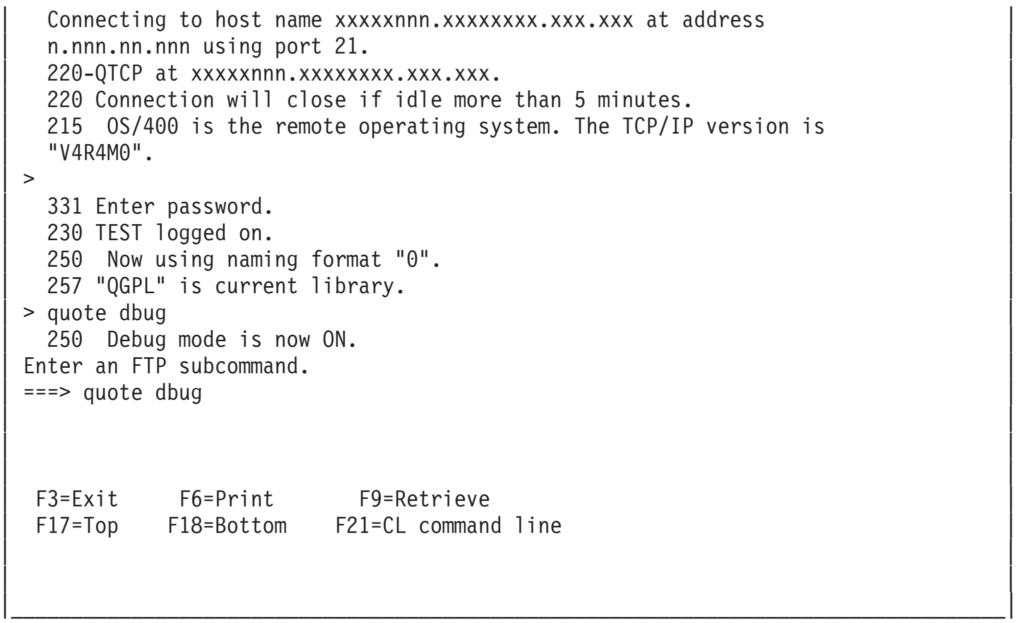
```
                           File Transfer Protocol

  Previous FTP subcommands and messages:
   Connecting to host name xxxxxnnn.xxxxxxxx.xxx.xxx at address
   n.nnn.nn.nnn using port 21.
   220-QTCP at xxxxxnnn.nnnnnnnn.nnn.nnn.
   220 Connection will close if idle more than 5 minutes.
   215  OS/400 is the remote operating system. The TCP/IP version is
   "V4R4M0".
 >
   331 Enter password.
   230 TEST logged on.
   250  Now using naming format "0".
   257 "QGPL" is current library.



 Enter an FTP subcommand.
 ===> quote dbug



  F3=Exit     F6=Print       F9=Retrieve
  F17=Top    F18=Bottom    F21=CL command line
```

To trace the FTP server:

1. Type `QUOTE DBUG` to start the trace.

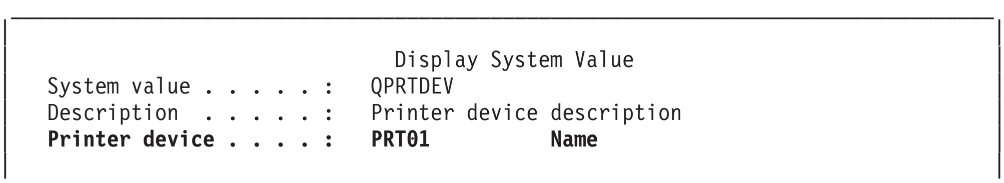


```
                           File Transfer Protocol

  Previous FTP subcommands and messages:
```



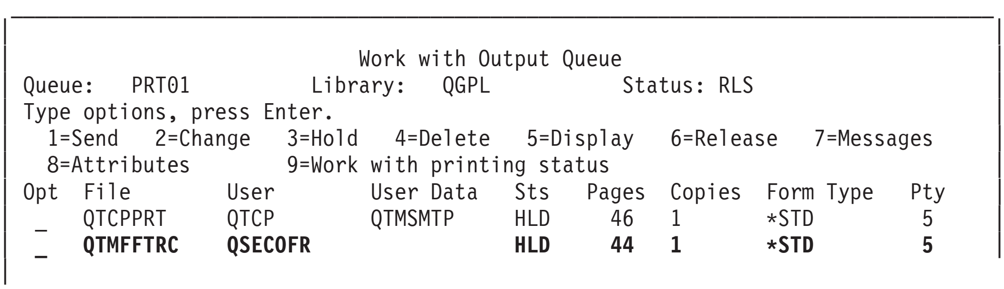
```
  Connecting to host name xxxxxnnn.xxxxxxxx.xxx.xxx at address
  n.nnn.nn.nnn using port 21.
  220-QTCP at xxxxxnnn.xxxxxxxx.xxx.xxx.
  220 Connection will close if idle more than 5 minutes.
  215  OS/400 is the remote operating system. The TCP/IP version is
  "V4R4M0".
>
  331 Enter password.
  230 TEST logged on.
  250  Now using naming format "0".
  257 "QGPL" is current library.
> quote dbug
  250  Debug mode is now ON.
Enter an FTP subcommand.
===> quote dbug



 F3=Exit     F6=Print       F9=Retrieve
 F17=Top    F18=Bottom    F21=CL command line
```

2. Perform the FTP operation that you want to trace.
3. Type `QUOTE DBUG` again to end the trace. The trace creates a spooled file called QTMFFTRC. The default output queue contains the spooled file. The user is always the name of the user who was logged on to the FTP server when the trace was ended.
4. Type `QUIT` to end the FTP session.
5. Enter the following command to find the output queue:
   `DSPSYSVAL QPRTDEV`
   For example, the following display appears:



```
                                 Display System Value
  System value . . . . . :   QPRTDEV
  Description  . . . . . :   Printer device description
  Printer device . . . . :   PRT01          Name
```

   The printer device is also the name of the default system output queue.
6. Record the name of the printer device. In this example, PRT01 is the printer device.
7. Press F12 (Cancel) to return to the display where you entered the DSPSYSVAL command.
8. Type the following command:
   `WRKOUTQ OUTQ(printer-device)`
   Replace `printer-device` with the printer device recorded in the previous display. PRT01 is the output queue in this example. For example, the following display appears:



```
                              Work with Output Queue
Queue:   PRT01          Library:   QGPL          Status: RLS
Type options, press Enter.
  1=Send   2=Change   3=Hold   4=Delete   5=Display   6=Release   7=Messages
  8=Attributes       9=Work with printing status
Opt  File        User        User Data   Sts   Pages  Copies  Form Type   Pty
 _   QTCPPRT     QTCP        QTMSMTP     HLD     46   1       *STD         5
 _   QTMFFTRC    QSECOFR                 HLD     44   1       *STD         5
```

9. Press F18 (Bottom) to get to the bottom of the spooled file list if More... appears on the display.

10. Find the last file named QTMFFTRC with the same user as the user who was logged on the FTP server when the trace was created.
11. Press F11 (View 2) to view the date and time of the file you want to work with.
12. Verify that you are working with the most recent spooled file, QTMFFTRC.

Indicate in the problem report that the trace was tried and it failed. Send whatever trace information there is with the problem report.

Tracing the FTP server with the Trace TCP/IP Application (TRCTCPAPP) command
The Trace TCP/IP Application (TRCTCPAPP) command (new for V4R4) allows *system-wide* tracing of *all* the FTP servers.

The TRCTCPAPP command is provided specifically for trained service and development personnel. *SERVICE special authority is required to use this command. Use TRCTCPAPP in situations that require the capturing of trace data for service and development use. This command allows experienced personnel to dynamically start and stop tracing for applications.

With the use of TRCTCPAPP, trace information can be captured for the FTP TCP/IP application:

- Internal trace information can be captured for the iSeries FTP server. The information that can be captured for the FTP server may be filtered using remote IP address and port or iSeries user profile. Only one trace can be active at a time on the system.

Here are two examples of the use of the TRCTCPAPP command:

Example 1:

```
TRCTCPAPP APP(*FTP) SET(*ON)
```

This will start tracing for all FTP servers. Tracing for all other TCP applications is not affected.
Example 2:

```
TRCTCPAPP APP(*FTP) SET(*CHK)
```

This command is used to check the status of the tracing for the FTP server job(s). Assume that the last command entered was: >

```
TRCTCPAPP APP(*FTP) SET(*ON) USER(JOECOOL)
```

The format of the response to this command would be a set of messages that would look similar to the following:

```
TCP45B7 TRCTCPAPP APP(*FTP) SET(*ON) USER(JOECOOL)
        MAXSTG(*DFT) TRCFULL(*WRAP)
TCP45B1 Tracing active for *FTP.
TCP45B2 Data capture begun for *FTP.
TCP45B3 Data buffer wrapped for *FTP.
```

Trace the FTP client

To produce an FTP client trace or display the subcommands sent to the FTP server, use the DEBUG FTP client subcommand. The DEBUG subcommand toggles the debugging mode. If an optional debug-value is specified, it is used to set the debugging level. When debugging is on, each subcommand sent to the server is displayed and preceded by the string '>>>'. The debug-value must be set to 100 to produce an FTP client trace.

```
DEBug [debug value]
```

debug value
If the debug-value is 0, debugging is off. If the debug-value is a positive integer, debugging is on.

If no value is specified, the debug-value is toggled from zero to one or from a positive integer to zero.

100
Initiate an FTP client trace. The client continues running the trace until DEBUG is turned off or until the FTP client is ended. (When the trace is ended, there may be a significant delay while the trace data is formatted.)

Note: The FTP client trace should only be used for reporting software problems to IBM. System performance may be adversely affected by this function.

A new capability has been added to the FTP client for debugging for V4R4. This function is similar to the DEBUG 100 described above. When the client is started, it first checks for the existence of a data area named QTMFTPD100.

You need to create the dataarea QTMFTPD100 in the QTEMP library using this command:

```
CRTDTAARA DTAARA(QTEMP/QTMFTPD100) TYPE(*LGL)AUT(*USE)
```

If the QTMFTPD100 dataarea exists, then it will set the debug value to 100 and start an FTP client trace. The purpose of this capability is to enable FTP client debug traces to be done in those situations when an FTP client trace *cannot* be started by issuing the DEBUG 100 subcommand.

Work with FTP server jobs and job log

A copy of the FTP server job log may be required to obtain additional information about errors that occur on the FTP server. The FTP server automatically writes a server job log to a spooled file when it ends with an error.

A server job log may be written to a spooled file without ending the server by issuing the following subcommand from an FTP client:

```
QUOTE RCMD DSPJOBLOG
```

To obtain a copy of error messages written to the server job log, this subcommand must be issued after the error has occurred. You can then inspect the job log using the WRKSPLF command.

This technique is recommended in those cases where the reply message returned to the client from the server only provides minimal information about an error occurring on the server machine. For example, this method is useful for obtaining details about I/O errors that occur on the server machine.

If the error prevents the FTP server job log from being obtained by the method described here, enter the following command to force a spooled job log to be created for each FTP session:

```
CHGJOBD JOBD(QUSRSYS/QTMFTPS) LOG(4 00 *SECLVL)
```

Then recreate the scenario which causes the error. To restore the original job log behavior after obtaining the required data, enter the following command:

```
CHGJOBD JOBD(QUSRSYS/QTMFTPS) LOG(4 00 *NOLOG)
```

To have a spooled job log produced at the end of each FTP session and each time an FTP server ends (with or without an error), use the Change Job Description (CHGJOBD) command as follows:

```
CHGJOBD JOBD(QUSRSYS/QTMFTPS) LOG(4 00 *SECLVL)
```

To get a spooled job log only when a server ends, use the CHGJOBD command as follows:

```
CHGJOBD JOBD(QUSRSYS/QTMFTPS) LOG(4 00 *NOLIST)
```

FTP server jobs and job names

The FTP server jobs are started when the STRTCP command is run and the FTP AUTOSTART parameter is set to *YES, or when the STRTCPSVR command is run with a SERVER parameter of *FTP or *ALL. These jobs run in the QSYSWRK subsystem and their purpose is to monitor for incoming FTP users. The format for the names of these jobs is QTFTPnnnnn. The nnnnn is the job number of the FTP server job submitting to this server.

To work with FTP server jobs, enter the following CL command:

```
WRKACTJOB JOB(QTFTP*)
```

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