NQE User's Guide
SG–2148 3.3

Document Number 007–3794–001

New Features

NQE User's Guide SG–2148 3.3

This revision of the *NQE User's Guide*, publication SG–2148, supports the 3.3 release of the Network Queuing Environment (NQE).

The NQE user documentation was revised to support the following NQE 3.3 features:

- Miser integration on Origin systems is supported. NQE will support the submission of jobs that specify Miser resources.
- On CRAY T3E systems, NQE now supports checkpointing and restarting of jobs. This feature was initially supported in the NQE 3.2.1 release.
- On CRAY T3E systems, NQE now supports the political scheduling feature. This includes obtaining fair-share information by using the multilayered user fair-share scheduling environment (MUSE) and scheduling a job for immediate execution with preferential CPU priority (prime job). (This feature was initially supported in the NQE 3.2.1 release.)
- Distributed Computing Environment (DCE) support was enhanced as follows:
  - Ticket forwarding and inheritance is now supported on selected platforms. This feature lets users submit jobs in a DCE environment without providing passwords. Ticket forwarding is supported on all NQE platforms except Digital UNIX systems. Ticket inheritance is supported only on UNICOS and IRIX systems
  - IRIX systems now support access to DCE resources for jobs submitted to NQE.

    Support for tasks that use a password for DCE authentication is available on all NQE 3.3 platforms.

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- The following NQE database enhancements were made:
  - Increased number of simultaneous connections for clients and execution nodes to the NQE database.
  - The `MAX_SCRIPT_SIZE` variable was added to the `nqeinfo` file, allowing an administrator to limit the size of the script file submitted to the NQE database. If the `MAX_SCRIPT_SIZE` variable is set to 0 or is not set, a script file of unlimited size is allowed. The script file is stored in the NQE database; if the file is bigger than `MAX_SCRIPT_SIZE`, it can affect the performance of NQE database and the `nqedbmgr`(8) command. The `nqeinfo`(5) man page includes a description of this new variable.
- The Network Queuing System (NQS) sets several environment variables that are passed to a login shell when NQS initiates a job. One of the environment variables set is `LOGNAME`, which is the name of the user under whose account the job will run. Some platforms, such as IRIX systems, use the `USER` environment variable rather than `LOGNAME`. On those platforms, `csh` writes an error message into the

job's `stderr` file, noting that the `USER` variable is not defined. To accommodate this difference, NQS now sets both the `LOGNAME` and `USER` environment variables to the same value before initiating a job. The `ilb`(1) man page was revised to include this new variable.

- The new `nqeinfo`(5) man page documents all NQE configuration variables; the `nqeinfo`(5) man page is provided in online form only and is accessible by using the `man`(1) command or through the NQE configuration utility `Help` facility.
- Array services support was added for UNICOS and UNICOS/mk systems. Array services let you manage related processes as a single unit, including processes running across multiple machines. Array services use array sessions to group these related processes together through use of a unique identifier called an array session handle (ASH). A global ASH is needed when the processes within an array session are not all running on the local node. The NQE request node now asks for a global ASH before initiating the job. NQE logs the global ASH associated with the job in a log message in the user's job log. The global ASH associated with a job is shown in a `Global ASH:` field in an NQE job log display. A job log display can be requested by supplying the NQE job identifier when using the `qstat -j` or `cqstatl -j` command, or the job log can be displayed through the NQE GUI by clicking on a specific job within the `Status` display and then selecting the `Actions->Job Log` menu. The global ASH for a job is also entered into the NQS log file.
- The capabilities of the NQE database scheduler (LWS) have been extended.
- The security enhancements to UNICOS/mk systems are supported with this NQE release.
- Overall performance of the Network Load Balancer (NLB) collector was increased; new information is provided.
- NQS now supports per-request limits for CPU usage, memory usage, and the number of processors when running on IRIX platforms. The per-request usage of these resources is displayed by the NQE GUI and the `cqstatl` and `qstat` commands. Requests that exceed the limits will be terminated. The periodic checkpointing of requests based on accumulated CPU time is also supported.
- The `NQE_DEFAULT_COMPLIST` configuration variable in the `nqeinfo` file has replaced the `NQE_TYPE` configuration variable, which defines the list of NQE components to be started or stopped.
- The CPU and memory scheduling weighting factors were added for application PEs. The NQS scheduling weighting factors are used with the NQS priority formula to calculate the intraqueue job initiation priority for NQS runnable jobs. This feature also restores the user-specified priority scheduling functionality (specified by the `cqsub -p` and `qsub -p` commands).
- The `-f` option was added to the `qdel`(1) command; this option specifies that no request output will be returned to the user. This option behaves similarly to the `-k` option except that the user's standard error, standard output, and job log files are not returned to the user or stored at the execution node in the NQS failed directory.
- Year 2000 support for NQE has been completed.
- The appendix that documents the NQE GUI was removed from this user's guide.

- Man pages were revised; man pages are provided in online form only as part of the NQE release package.

For a complete list of new features for the NQE 3.3 release, see the *NQE Release Overview*, publication RO–5237.

Record of Revision

Version	*Description*
1.0	December 1993. Original Printing. This publication describes how to use the Cray Network Queuing Environment (NQE), release 1.0, running on UNIX or UNICOS systems.
1.1	June 1994. Incorporates information for NQE release 1.1.
2.0	May 1995. Incorporates information for the NQE 2.0 release. This publication also supports Network Queuing EXtensions (NQX) that is synchronous with the UNICOS 9.0 release.
3.0	March 1996. Incorporates information for the NQE 3.0 release.
3.1	September 1996. Incorporates information for the NQE 3.1 release.
3.2	January 1997. Incorporates information for the NQE 3.2 release. This document was revised and is provided in online form only for this release.
3.3	March 1998. Incorporates information for the NQE 3.3 release.

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Preface

This publication describes how to use the Cray Network Queuing Environment (NQE). NQE is a software product that lets you submit, monitor, and control batch jobs for execution on Network Queuing System (NQS) server nodes in the NQE cluster.

The Network Load Balancer (NLB) uses the system load information received from NQS server nodes to offer NQS an ordered list of nodes to run a request; NQS uses the list to distribute the request.

The NQE database provides an alternate mechanism for distributing work. Requests are submitted and stored centrally. The NQE scheduler examines each request and determines when and where the request is run.

The File Transfer Agent (FTA) provides asynchronous and synchronous file transfer. You can queue your transfers so that they are retried if a network link fails.

This manual contains the following chapters:

- Chapter 1, page 1, provides an overview of NQE components and basic functions.
- Chapter 2, page 21, describes which environment variables you must set to use NQE, how to set up NQE database authorization, and how NQS authorizes you to use client commands in the group of execution nodes in the NQE cluster.
- Chapter 3, page 43, describes how to create a request and describes basic options you can use.
- Chapter 4, page 49, describes using the NQE GUI or command-line interface to submit requests, using the NLB default queue, submitting requests to the NQE database, using request attributes, and using basic options.
- Chapter 5, page 85, describes how to use limits, password prompting, alternative user names, and several miscellaneous options in your requests.
- Chapter 6, page 107, describes how to customize where your output is delivered and how to find it if it did not go where you expected it to go.
- Chapter 7, page 113, describes how to monitor your output when your request is executing and how to write messages to executing requests.

- Chapter 8, page 121, describes how to use the `cevent`(1) command to make events in script files or requests interdependent.
- Chapter 9, page 127, describes how to use environment variables to customize your NQS and NQE environments, and how to configure NQE displays.
- Chapter 10, page 137, describes how to use the NQE GUI `Status` window and the `cqstatl`(1) and `qstat`(1) commands to view request status.
- Chapter 11, page 155, describes the `cqstatl`(1) and `qstat`(1) command options available for viewing queue information.
- Chapter 12, page 169, describes how to delete a request.
- Chapter 13, page 177, describes how to signal a request.
- Chapter 14, page 183, describes how to use the `ftua`(1) and `rft`(1) commands to transfer files.
- Chapter 15, page 215, describes how to use the NQE GUI `Load` window to monitor system status.
- Chapter 16, page 223, provides troubleshooting information.

This manual also includes the following appendixes and glossary:

- Appendix A, page 235, provides a list of all online user-level man pages.
- Appendix B, page 237, provides sample exercises on how to submit, monitor, and control a batch request.
- Appendix C, page 269, provides information on how to use the ARPAnet standard file transfer protocol (FTP) with NQS on UNICOS or UNICOS/mk systems.
- Glossary, page 281 defines terms used in this guide.

Related Publications

The following documents contain additional information that may be helpful:

- *NQE Administration*, publication SG–2150, provides information on configuring, monitoring, and controlling NQE. This publication may also be accessed online by using the Cray DynaWeb server and through the Silicon

Graphics Technical Publications Library World Wide Web page at the following URL:

`http://techpubs.sgi.com/library/`

- *Introducing NQE*, publication IN–2153, provides an overview of NQE functionality and describes how to access documentation online. This publication also may be accessed online by using the Cray DynaWeb server and through the Silicon Graphics Technical Publications Library World Wide Web page at the following URL:

  `http://techpubs.sgi.com/library/`

- *NQE Installation*, publication SG–5236, describes how to install or upgrade the NQE software. This publication also may be accessed online by using the Cray DynaWeb server and through the Silicon Graphics Technical Publications Library World Wide Web page at the following URL:

  `http://techpubs.sgi.com/library/`

- *NQE Release Overview*, publication RO–5237, provides NQE release information. This publication also may be accessed online by using the Cray DynaWeb server and through the Silicon Graphics Technical Publications Library World Wide Web page at the following URL:

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Conventions

The following conventions are used throughout this document:

Convention	Meaning
`command`	This fixed-space font denotes literal items such as commands, files, routines, path names, signals, messages, and programming language structures.
`manpage`(*x*)	Man page section identifiers appear in parentheses after man page names. The following list describes the identifiers: 1 User commands 1B User commands ported from BSD 2 System calls 3 Library routines, macros, and opdefs 4 Devices (special files) 4P Protocols 5 File formats 7 Miscellaneous topics 7D DWB-related information 8 Administrator commands Some internal routines (for example, the `_assign_asgcmd_info`() routine) do not have man pages associated with them.
variable	Italic typeface denotes variable entries and words or concepts being defined.
`user input`	This bold, fixed-space font denotes literal items that the user enters in interactive sessions. Output is shown in nonbold, fixed-space font.
[ ]	Brackets enclose optional portions of a command or directive line.

...	Ellipses indicate that a preceding element can be repeated.

The default shell in the UNICOS and UNICOS/mk operating systems, referred to in Cray Research documentation as the *standard shell*, is a version of the Korn shell that conforms to the following standards:

- Institute of Electrical and Electronics Engineers (IEEE) Portable Operating System Interface (POSIX) Standard 1003.2–1992
- X/Open Portability Guide, Issue 4 (XPG4)

The UNICOS and UNICOS/mk operating systems also support the optional use of the C shell.

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Seeing the Big Picture [1]

This chapter provides an overview of the Network Queuing Environment (NQE). The following topics are discussed:

- A brief definition of NQE, including what is contained in the NQE cluster, and a brief definition of the NQE components (Section 1.1, page 1)
- How NQE works, including descriptions of the components, the flow of a request submitted to NQE, and the differences between submitting a request to NQS or to the NQE database for processing (Section 1.2, page 4)
- Brief descriptions of the NQE graphical user interface (GUI) and command line interface (Section 1.3, page 11)
- Brief descriptions of the following tasks:
  - Preparing to use NQE (Section 1.4, page 15)
  - Creating batch requests (Section 1.5, page 15)
  - Submitting requests (Section 1.6, page 16)
  - Monitoring requests and queues (Section 1.7, page 16)
  - Examining output (Section 1.8, page 17)
  - Deleting or signaling requests (Section 1.9, page 17)
  - Transferring files (Section 1.10, page 17)
  - Using the `ilb` command (Section 1.11, page 18)

The remaining chapters of this guide describe in detail all user tasks.

You also may want to read *Introducing NQE*, publication IN–2153, which provides a quick overview of how to perform basic user tasks. You can access *Introducing NQE*, publication IN–2153, online by using the Cray DynaWeb server.

1.1 NQE Components and NQE Cluster Components

NQE is a set of clients and servers that lets you submit requests to be executed across a load-balanced network of hosts. NQE supports computing with a large number of nodes in a large network that supports two basic models:

- The NQE database model that supports up to 36 servers and hundreds of clients.
- The NQS model that supports an unlimited number of NQS servers and hundreds of clients.

The grouping of servers and clients is referred to as an NQE *cluster*. The servers provide reliable, unattended processing and management of the NQE cluster. Users who have long running requests and a need for reliability can submit batch requests to an NQE cluster.

Batch requests are shell scripts that are executed independently from an interactive terminal session. You submit requests from NQE clients and they are executed at NQS server nodes. You also can log on to nodes and submit requests. You can monitor and control the progress of a batch request through the NQE components in the NQE cluster.

The following sections describe the NQE components and the NQE cluster components.

1.1.1 NQE Components

NQE includes the following components:

- An *NQE client* provides the client user interfaces to NQE. It supports the submission, monitoring, and control of work from the workstation for job execution of the batch request on the nodes. NQE clients are intended to run on every node in the NQE cluster where users need an interactive interface to the NQE cluster. It provides the NQE GUI (accessed through the `nqe` command) and a command line interface.

  For a description of the user interfaces, see Section 1.3, page 11.

- The Network Queuing System (NQS) initiates requests on NQS servers. An *NQS server* is the host on which NQS runs. Your default NQS server is designated by your system administrator and is specified in the NQE configuration file (`nqeinfo`); you can submit your request to a specific NQS server by setting the `NQS_SERVER` environment variable, which overrides the default value of `NQS_SERVER` defined by your system administrator.
- The *Network Load Balancer (NLB)* provides status and control of work scheduling within the group of components in the NQE cluster. This information is then used to load balance batch requests across NQS servers in the NQE cluster. The NLB offers NQS a list of servers, in order of preference, to run a request; NQS uses the list to route the request.

- The *NQE database* provides a central repository for batch requests in the NQE cluster. The NQE scheduler uses the NQE database and an alternative mechanism for distributing work. The NQE scheduler examines each request and determines when and on which execution node the request will run. The lightweight server (LWS) verifies validation, submits the copy of a request to NQS, and obtains exit status of completed requests from NQS.
- The *File Transfer Agent (FTA)* provides asynchronous and synchronous file transfer. You can queue your transfers so that they are retried if a network link fails.

  Note: If you are running NQE without a license on a Cray PVP system, only the NQS and FTA components are accessible.

1.1.2 NQE Cluster Components

The NQE cluster can contain the following components:

- The Network Load Balancer (NLB) server, which receives and stores information from the NLB collectors in the NLB database that it manages. For more information on the NLB, see Chapter 15, page 215.
- The NQE database server, which serves connections from clients, the scheduler, the monitor and lightweight server (LWS) components in the cluster to add, modify, or remove data from the NQE database. Currently, NQE uses the mSQL database. For more information on the NQE database server, see Section 4.3, page 56.
- The NQE scheduler, which analyzes data in the NQE database, and makes scheduling decisions. For more information on the NQE scheduler, see *NQE Administration*, publication SG–2150.
- The NQE database monitor, which monitors the state of the database and which NQE database components are connected. For more information on the NQE database monitor, see *NQE Administration*, publication SG–2150.
- NQE *clients* (running on numerous machines) contain software so users can submit, monitor, and control requests by using either the NQE graphical user interface (GUI) or the command line interface. From clients, users also can monitor request status, delete or signal requests, monitor machine load, and receive request output using the FTA.

The machines in your network where you run NQS are usually machines that have a large execution capacity. Job requests can be submitted from components in an NQE cluster, but they will only be initiated on an NQS server node.

FTA can be used from any NQS server node to transfer data to and from any node in the network by using the `ftpd` daemon. It also can provide file transfer by communicating with `ftad` daemons that incorporate network peer-to-peer authorization, which is a more secure method than `ftp`.

On NQS servers, you need to run a collector process to gather information about the machine for load balancing and request status for the NQE GUI `Status` and `Load` windows programs. The collector forwards this data to the NLB server.

The NLB server runs on one or more NQE nodes in a cluster, but it is easiest to run it initially on the first node where you install NQE. Redundant NLB servers ensure that the NLB database has a greater availability if an NLB server cannot be reached through the cluster.

Note: The NQE database must be on only one NQE node; there is no redundancy.

1.2 How NQE Works

This section describes how your work is processed by using NQE. It describes the general flow of a request and how a request flows through NQS queues.

1.2.1 Work Flow

Using NQE, you can submit a request to NQS or to the NQE database. The following sections describe the work flow of a request submitted to each of these destinations. For more information about submitting requests, see Chapter 4, page 49.

1.2.1.1 Flow of a Request Submitted to NQS by Using the NLB

When you submit a request to NQS, by default NQS solicits information from the NLB to determine which NQE execution node will receive and process the request.

Note: Your site may have changed the defaults; contact your system administrator if your environment seems to work differently.

Figure 1, page 6 shows how a request flows through NQE when you send a request directly to NQS by using the NLB. The steps are as follows:

1. From your client workstation, you submit your request to schedule and initiate a batch job. For information about the user interfaces, see Section 1.3, page 11.
2. Through the NQE client, your request enters NQS on your NQS server (as indicated by your `NQS_SERVER` environment variable).
3. NQS solicits information from the NLB about the most appropriate servers and queues for your request.
4. The NLB uses the system load information received from other NQE nodes in the network and offers NQS a list of servers, in order of preference, to run a request.
5. Using this information, NQS sends the request to the most appropriate destination in the NQE cluster. It may queue the request locally at your NQS server. The request is assigned a unique NQS request identifier (*requestid*).
6. From your client workstation, you monitor your request by using the NQE GUI `Status` window or the `cqstatl` command. (From a node, you can also use the `qstat` command to monitor your request.)
7. The request executes on the host selected in step 5.
8. When the job request completes, standard output and standard error files are returned to you by default at your client workstation.

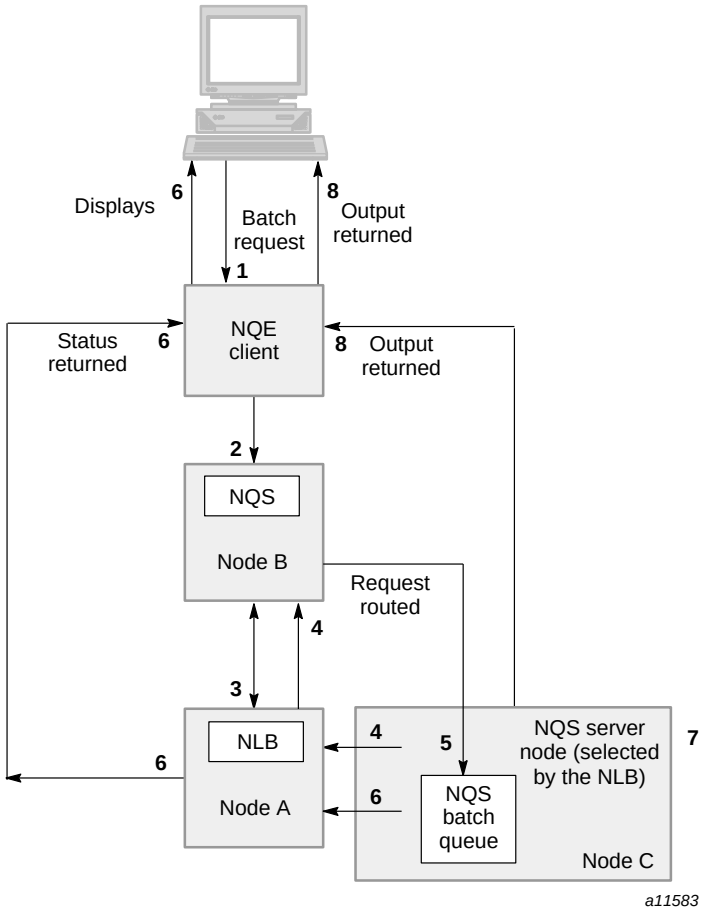


Figure 1. Work Flow through NQE Using the NLB with NQS

1.2.1.2 Flow of a Request Submitted to the NQE Database

When you submit a request to the NQE database, it works with an administrator-defined NQE scheduler to analyze your request and to determine which NQS server will receive and process the request.

When the scheduler has chosen a server for your request, a copy of your request is sent to the NQE node. The original request remains in the NQE database. Because the original request remains in the NQE database, if a problem occurs during execution and the copy of the request is lost, a new copy can be submitted for processing.

For more information about submitting a request to the NQE database, see Section 4.3, page 56.

Figure 2, page 8 shows how a request flows through NQE when you send a request to the NQE database. The steps are as follows:

1. From your client workstation, you submit your request to schedule and initiate a batch job. For information about the user interfaces, see Section 1.3, page 11.
2. Through the NQE client, your request is sent to the NQE database. A request submitted to the NQE database is called a *task*, and it is assigned a unique task identifier (`t`*id*).
3. The NQE scheduler examines the request in the NQE database and determines when and where the request will run. The scheduled node can be any NQS server node in the NQE cluster.
4. The lightweight server (LWS) on the scheduled NQE node receives a copy of the request from the NQE database.
5. The LWS submits a local request to NQS. The request is placed in a local batch queue to run. The request is assigned a unique NQS request identifier (*requestid*). The LWS updates the NQE database with this information.
6. You can monitor the status of your request by using the NQE GUI `Status` window. The status information is obtained from the NQE database and displayed on your client workstation.
7. The request executes on the host selected in 3.
8. When the job request completes, standard output and standard error files are returned to you by default at your client workstation.
9. When the job request completes, the NQE database is updated with exit information. However, the request is not deleted from the NQE database immediately so that you can continue to get information about the request and its status. Your system administrator determines how long data remains in the NQE database after the request has completed.

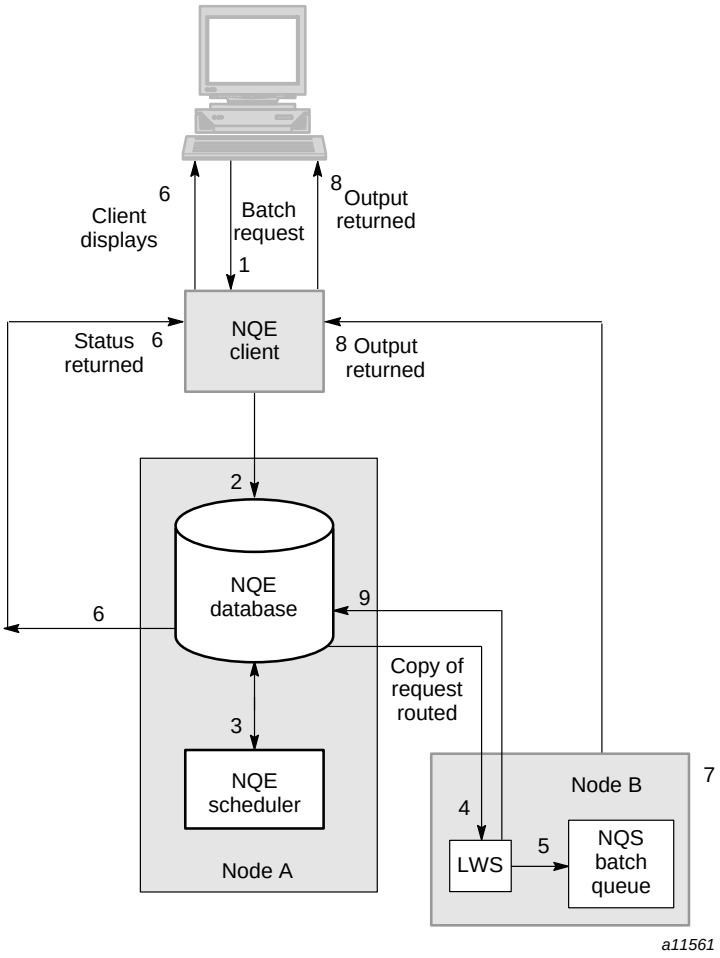


Figure 2. Work Flow through NQE Using the NQE Database and Its Scheduler

1.2.2 NQS Queues

To process your request, NQE may send it through a series of queues. A *queue* is a list of job requests waiting to be scheduled and initiated.

NQS has three types of queues:

- *Batch queues* initiate job requests. Generally, a job request in a batch queue is executing or waiting for resources so that it can execute.

- *Pipe queues* route requests. A pipe queue sends the request to another queue for further processing. This other queue could be on any NQS server in the NQE cluster. It could be a batch queue that will initiate the request or a pipe queue that will route it further. If your request cannot enter the queue to which it was sent, NQS sends you a mail message that explains the problem.

  Pipe queues are not used if you send your job request to the NQE database.

- Destination-selection queues load-balance job requests. These are pipe queues that do not have a preset destination. Instead, destinations are determined by load-balancing policies.

  When a request enters a destination-selection pipe queue, NQS queries the NLB for a list of destinations that could process your request. The NLB returns a list of destinations that is ordered according to the administrator-defined policy at your site. If for some reason the first destination cannot accept the request, the second is tried, and so on.

  Destination-selection pipe queues are not used if you send your request to the NQE database.

Figure 3 shows an example of how requests submitted to NQS may flow from your client workstation through NQS queues.

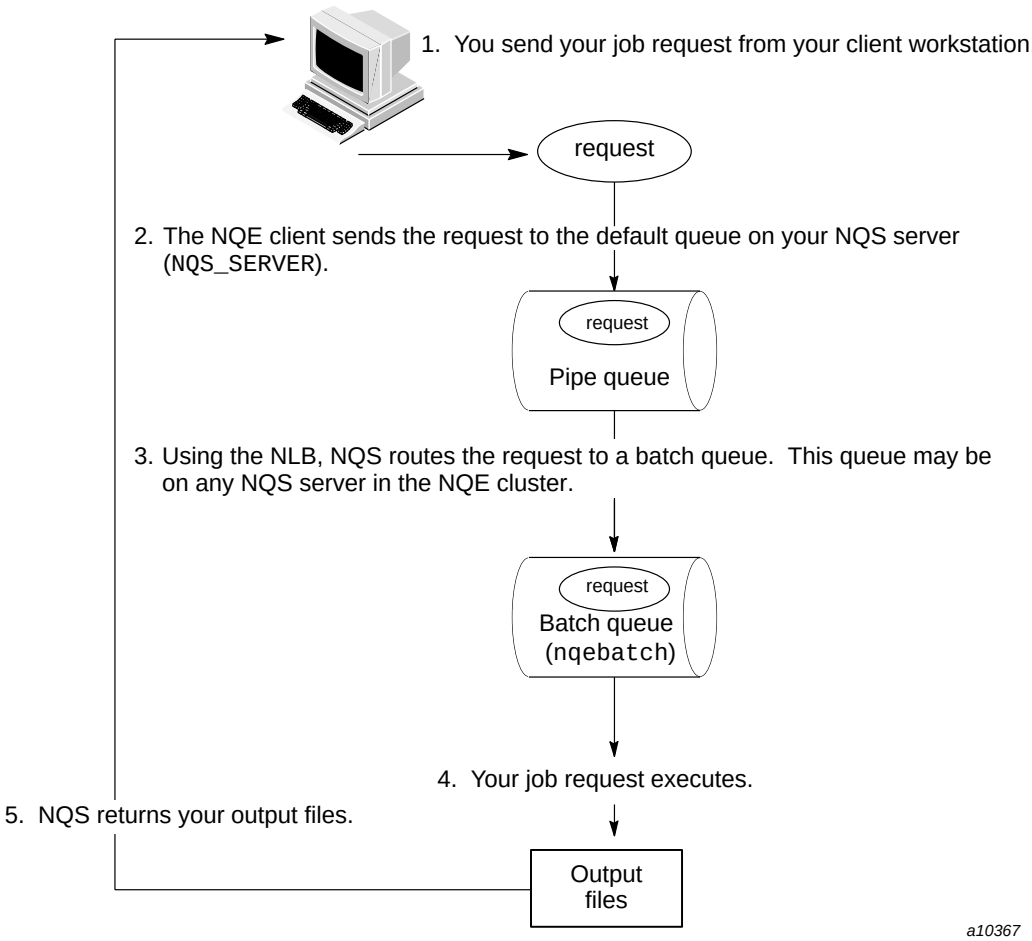


Figure 3. Detail of Work Flow through NQE When Submitting Directly to NQS

Figure 4 shows an example of how requests submitted to the NQE database flow from your client workstation through an NQS batch queue.

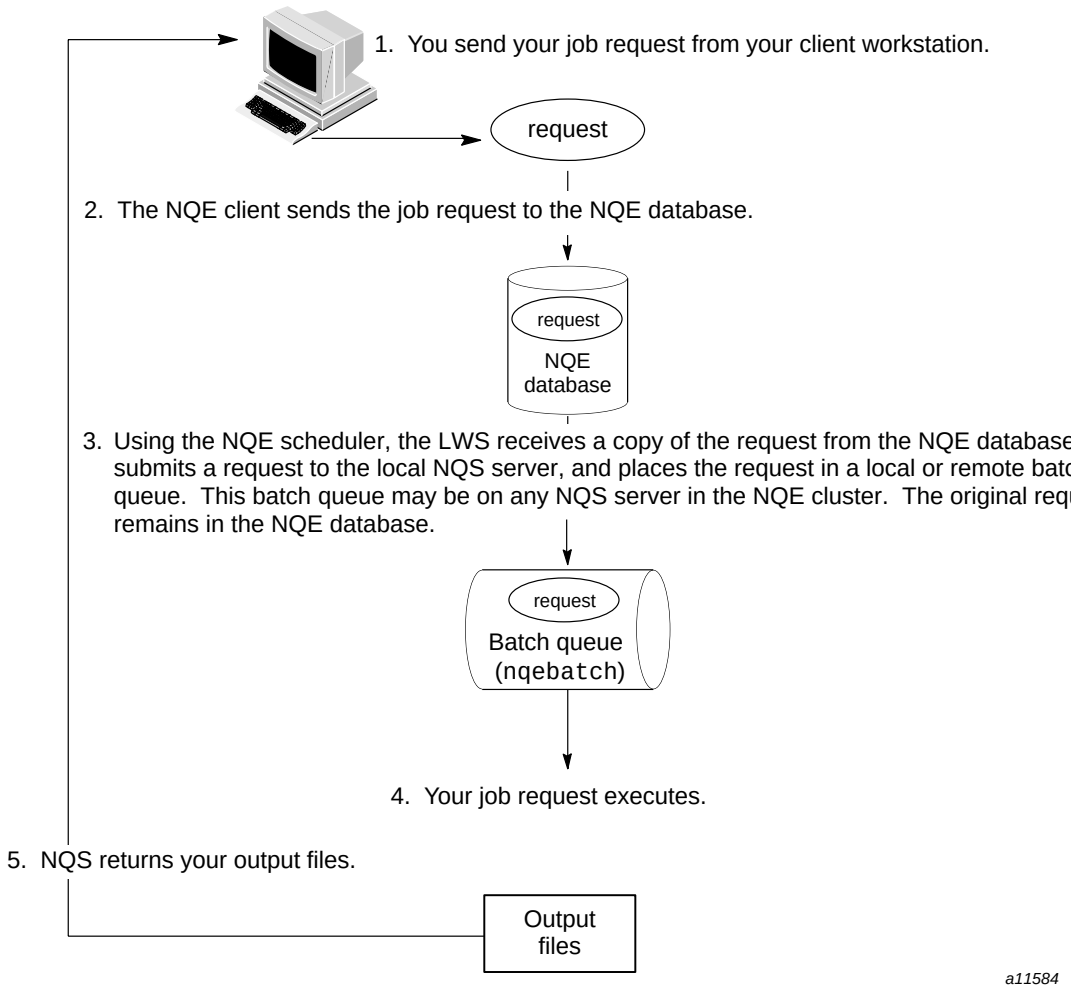


Figure 4. Detail of Work Flow When Submitting to the NQE Database

1.3 User Interfaces

You can use the NQE graphical user interface (GUI) or a command line interface to do most of the functions described in this guide. The following sections provide a brief overview of these functions. (You also can submit your request by using a World Wide Web (WWW) interface; for further information, ask your system administrator.)

1.3.1 NQE Graphical User Interface

The NQE GUI is similar to a Motif interface. To access the NQE GUI, execute the `nqe` command. Figure 5 shows the initial NQE GUI button bar window that will appear:

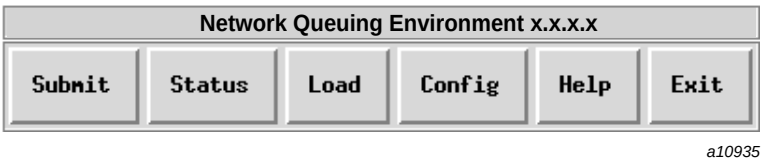


Figure 5. Initial NQE GUI Button Bar Window

To access a window, use the left mouse button and click on the button once.

You can use the NQE GUI for the following tasks:

- Use the `Submit` window to do the following:
  - Open and edit a job script
  - Save changes made to a job script
  - Submit a request to NQE
  - Launch a request on a periodic basis
  - From within the `Submit` window, reset your configuration preferences for the request you are submitting
  - View, segment, delete, or reset your NQE GUI log
  - Set or unset your password
  - Configure and save your job-related options (job profile)
- Use the `Status` window to do the following:
  - View updated status of your requests (the window is refreshed periodically)
  - View updated status of your FTA file transfers (the window is refreshed periodically)

  - Delete a request
  - Send a specified signal to a request
  - View the detailed status of a request
  - Set or unset your password

Context-sensitive help is displayed as you glide your mouse cursor over a menu or field name in the `Status` window; a brief description of the menu or field appears at the bottom of the display.

- Use the `Load` window to do the following:
  - Display continually updated system load information for machines in the group of execution nodes in the NQE cluster
  - Display data about a specific host
  - Display the same data that is provided on the main `Load` window, but have it grouped by host rather than by type of data
- Use the `Config` window to do the following:
  - Set your preferences for the following: A specific NQS server, default job profile, temporary directory, job script, job output, job profile, and NQE GUI log directories.
  - View your currently set preferences
- To display the current NQE version number and copyright information in the `Submit`, `Status`, and `Config` windows, use the left mouse button and click once on the Cray Research logo button.
- To access online help, use the left mouse button and click once on the `Help` button.
- To exit the NQE GUI, use the left mouse button and click on the `Exit` button.

When the mouse pointer is within a display area of a specific NQE GUI window, you can use the `ALT` key and the underscored letter from the menu bar to pop up submenus and to select more submenu options. An alternative way to do this is to use the `F10` key to activate the menu bar and then use the cursor movement keys to select submenus and options.

For a summary of the NQE GUI displays and functions, see the `nqe`(1) man page.

1.3.2 Command Line Interface

NQE provides a command line interface for the following user functions. Each of the commands listed in this section is documented on a man page (man pages are provided in online form only).

You can issue the following commands from any NQE node because all NQE nodes contain the NQE client software:

Command	Description
`cevent`	Posts, reads, and deletes job-dependency event information
`cqdel`	Signals a request that is either running or awaiting processing
`cqstatl`	Displays the status of NQE work through a line-mode, static display
`cqsub`	Submits a script file to NQE for execution
`ilb`	Executes a load-balanced interactive command; for an overview of the `ilb` command, see Section 1.11, page 18; for detailed information about the `ilb` command, see the `ilb`(1) man page.

You can issue the following commands only at an NQE node that has installed the NQE components; if you issue them from an NQE client, they have no effect. The following commands are not installed on NQE clients; they do not recognize the `NQS_SERVER` environment variable:

Command	Description
`ftua`	Transfers a file interactively
`qalter`	Alters the attributes of one or more NQS requests
`qchkpnt`	Checkpoints an NQS request on a UNICOS, UNICOS/mk, or IRIX system
`qdel`	Deletes or signals an NQS request
`qlimit`	Displays NQS batch limits for the local host
`qmsg`	Writes messages to `stderr`, `stdout`, or the job log file of an NQS batch request
`qping`	Determines whether the local NQS daemon is running and responding to requests
`qstat`	Displays the status of NQS queues, requests, and queue complexes

`qsub`	Submits a batch request to NQS
`rft`	Transfers a file to and from a remote system

For a list of all user-level man pages provided online, see Appendix A, page 235.

1.4 Preparing to Use NQE

To use NQE, you must set certain environment variables. For an explanation of which environment variables you must set, see Section 2.2, page 22. For a list of optional environment variables you can set, see Chapter 9, page 127.

To submit requests to the NQE database, you must have a database user account (`dbuser`) that has user privileges. Your NQE administrator controls who has access to the database and from which client host. For information about how to specify your database user name, see Section 2.3, page 24, or Section 4.3.1, page 56.

By default, NQS uses file validation to authorize users. NQS also may be configured to use password validation or both file and password validation.

For additional information about preparing to use NQE and about validation files, see Chapter 2, page 21.

1.5 Creating Batch Requests

Before you submit a batch request, you usually will create a script file that contains the UNIX commands that make up the request. To create this file, use any text editor (such as `vi`). You also can create a batch request from within the NQE GUI `Submit` window.

A batch request can be one command, such as `ls` (which lists files). Usually, however, batch requests contain several commands.

On UNICOS, UNICOS/mk, or IRIX systems, you can checkpoint an executing request at any time during its execution by saving its current image in a restart file by including `qchkpnt`(1) statements within the script file. You then can use the restart file to restart the job from a known point if a system interrupt occurs.

For more information about creating a batch request, see Chapter 3, page 43. For more detailed information about customizing a batch request, see Chapter 5, page 85.

1.6 Submitting Requests

You can submit a request to run under UNIX or under the Distributed Computing Environment (DCE). For information about how to submit a request to DCE, see Chapter 4, page 49.

To submit a request to NQE, you can use either the NQE GUI or the command line interface.

To use the NQE GUI, key in the `nqe` command at the prompt and, using the left mouse button, click once on the `Submit` button of the initial NQE GUI button bar.

To use the command line interface to submit a batch request to NQE, use the `cqsub` or `qsub` command. For a complete list of the options, see the `cqsub`(1) or `qsub`(1) man page.

For more information about submitting a request for execution, see Chapter 4, page 49.

1.7 Monitoring Requests and Queues

To view where your request is in the NQE network, use the NQE GUI `Status` window or the `cqstatl` or `qstat` command.

When you use the NQE GUI `Status` window, the default window shows the status of all of your requests in the NQE cluster. Using the NQE GUI has the following advantages over using the `cqstatl` or `qstat` command:

- A display is refreshed periodically. To get new information, you do not need to reissue a command.
- A request is easy to find. All of your requests are displayed on the main NQE GUI `Status` window; you do not need to specify a specific node.

When you use the `cqstatl` or `qstat` command, you can obtain information about all queues on that NQE node. The NQE GUI does not display any information about queue structures; only queues that contain requests are displayed through the NQE GUI.

For detailed information about monitoring requests, see Chapter 10, page 137. For detailed information about monitoring queues, see Chapter 11, page 155.

1.8 Examining Output

After your batch request completes, NQS returns standard output and standard error files to you. If you use the NQE GUI, the files are written to your home directory by default. If you use the command line interface, by default the files are written to the directory you were in when you issued the `cqsub` or `qsub` command.

For information about working with output files, see Chapter 6, page 107. For information about communicating with output, see Chapter 7, page 113.

1.9 Deleting or Signaling Requests

You can delete or signal a request that you have submitted to NQE. The request may be executing or may be waiting to execute on an NQS server node.

> **Note:** You can send any UNIX signal to a request. Your request script could be written to trap the signal and then take some appropriate action, rather than to abort.

To delete an executing request, you can use either the NQE GUI `Status` window or the `cqdel` or `qdel` command. If you use the `cqdel` or `qdel` command, you must send it a UNIX signal. You can send one of several signals to a request; one of the most common is the `SIGKILL` signal, which aborts a running process.

Standard output, standard error, and job log files are still produced for an executing request that is deleted by a signal. These files record the execution of the request up to the moment that the signal is received.

For more information about deleting a request, see Chapter 12, page 169. For more information about sending a signal to a request, see Chapter 13, page 177.

1.10 Transferring Files

You can transfer files between remote systems on a network either from within a batch request or interactively by using the NQE File Transfer Agent (FTA). The `ftua` and `rft` commands transfer files. The `ftua` interface to FTA is similar to the TCP/IP `ftp` utility. File transfers can be initiated on NQE nodes only.

You might choose to use FTA for the following reasons:

- You can queue your transfers. You can execute file transfers immediately or queue them for later execution. If the transfer is queued, it is executed after you leave the utility, letting you proceed to other tasks.
- You can display queued transfers. If you have issued a file transfer request in queue mode, you can display details about the request. To view the status of an FTA transfer, you can use either the NQE GUI or the `qls` command.
- Your transfers are retried. If your file transfer fails for some transient reason (such as a network link failing), FTA automatically requeues the transfer. Retries are useful in batch requests because your requests will not abort if a transfer cannot occur when it is first tried.
- You do not have to provide passwords. FTA provides network peer-to-peer authorization (NPPA). NPPA lets you transfer files without specifying passwords in either batch request files or in `.netrc` files or by transmitting passwords over the network. For more information on NPPA, see Section 14.5, page 213.
- It provides both synchronous and asynchronous reliable file transfer. If a transient error condition occurs during the transfer, transfers are retried. Retries are useful when transferring files from within an NQS request.

  If you disable the synchronous feature by selecting the `-nowait` option, the transfers are done in asynchronous fashion but are still reliable.

To transfer files from within a batch request, use the `rft` command. The `rft` command has the following advantages over other file transfer commands:

- It is a one-line interface to FTA. This makes it easier to use in batch job requests.
- `rft` provides an option that deletes the local file on the completion of a transfer. This is useful when transferring files at the end of an NQS request to the system from which you submitted the request.

For more information about using FTA, see Chapter 14, page 183.

1.11 Using the `ilb` Command

The `ilb` utility lets you execute a command on a machine chosen by the NLB. Enter the `ilb` command followed by the command you wish to execute. The NLB is then queried to determine which machine to log you into. Once the login process is complete, the command is executed and I/O is connected to your terminal or pipeline.

The `.ilbrc` file contains login and initialization information used during the automated login process. The `.ilbrc` file must reside in your home directory on the local host. The default system `ilbrc` file contains information that the `ilb` utility uses to establish connections to remote systems.

The following example executes the `uname` command on the system chosen by the NLB and returns the output to the user's terminal:

```
$ ilb uname -a
Attempting connection to pendulum...
ILB Info: Using /usr/bsd/rlogin to connect, based on PATH.
Executing uname -a...
IRIX pendulum 6.2 06101030 IP22
```

For detailed information about the `ilb` command, see the `ilb`(1) man page.

Preparing to Use NQE [2]

This chapter describes which environment variables you must set to use NQE, how to set up NQE database authorization, and how to set up NQS validation. It discusses the following topics:

2.1 NQE File Structure

Throughout this guide, the path */nqebase* is used in place of the default NQE path name, which is `/usr/craysoft/nqe` on all systems except Solaris, UNICOS, and UNICOS/mk systems, where it is `/opt/craysoft/nqe`.

Figure 6 shows the NQE file structure.

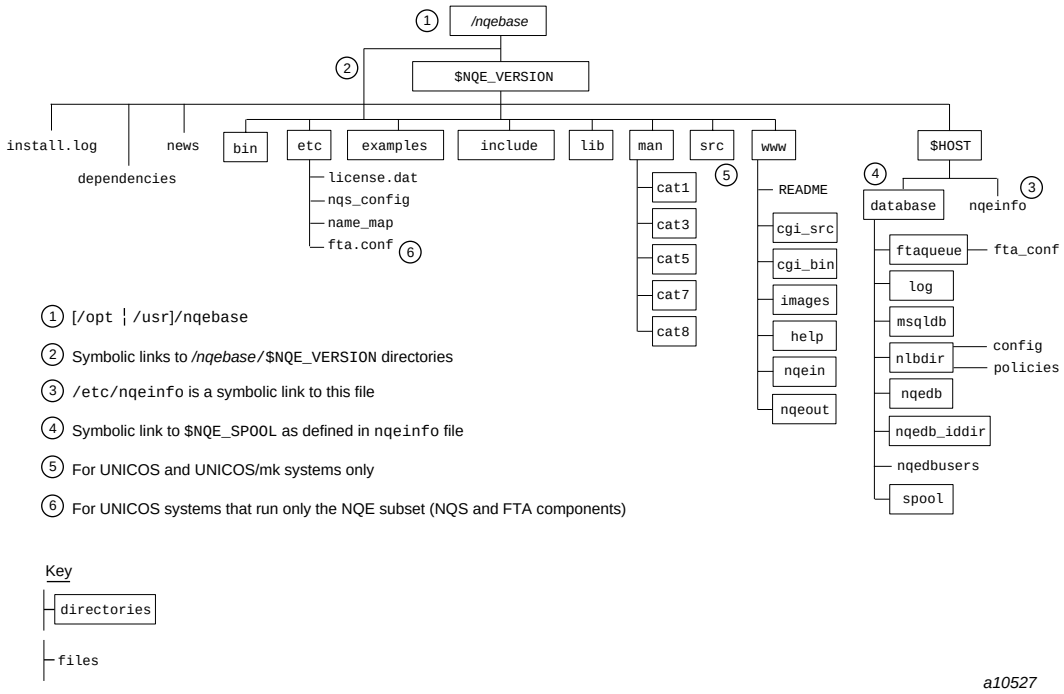


Figure 6. NQE File Structure

2.2 Setting Environment Variables

To use NQE, you must set the following environment variables:

- `DISPLAY` must be set to *local_workstation_name*`:0` for the NQE graphical user interface (GUI) to work.

  Note: If your site has access control in place for using X Window System applications, contact your system administrator to determine if you need additional settings.

- `PATH` must include the path name of the NQE commands. The default path name is */nqebase*`/bin`. System administrators also must include */nqebase*`/etc` in their `PATH` environment variable to use certain NQE administrator commands.

- `MANPATH` must include the path name of the NQE man pages. The default name is */nqebase*`/man`.

To verify whether your site's path names are the NQE system default, use the following command:

```
cd /nqebase/bin
```

If this command is not successful, ask your system administrator where the NQE software is located and add those directories to your PATH and MANPATH environment variables.

The commands that you use to set the environment variables depend on the shell that you use. For UNICOS and UNICOS/mk systems, the standard shell (or Korn shell) is the default shell.

> **Note:** For UNICOS and UNICOS/mk systems, if you want to use the UNICOS module(1) interface to acquire the environment variables for NQE, check with your system administrator to see if the modules package has been installed on your system.

For a list of other NQE environment variables that you can set to customize your environment, see Section 9.2, page 129.

The following example uses sh syntax to set and display NQE environment variables:

```
# PATH=$PATH:/nqebase/bin:/nqebase/etc; export PATH
# MANPATH=:/nqebase/man; export MANPATH
# DISPLAY=snow32:0; export DISPLAY
# env
LOGNAME=you
MAIL=/var/mail/you
USER=you
SHELL=/bin/sh
PWD=/home/snow32/you
MANPATH=:/nqebase/man
PATH=/usr/bin::/nqebase/bin:/nqebase/etc
DISPLAY=snow32:0
```

The following example uses csh syntax to set and display the NQE environment variables:

```
% setenv PATH /nqebase/bin:/nqebase/etc:$PATH
% setenv MANPATH /nqebase/man:$MANPATH
% setenv DISPLAY snow32:0
% env
HOME=/home/snow32/you
SHELL=/bin/csh
TERM=xterm
USER=you
LOGNAME=you
PWD=/home/snow32/you
MANPATH=/usr/man:/opt/local/man:/nqebase/man
PATH=/usr/bin:/nqebase/bin:/nqebase/etc
DISPLAY=snow32:0
```

2.3 NQE Database Authorization

To submit or control a request or to get a status of a request in the NQE database, you must have a database user `dbuser` account with the proper authorization (user privileges). This database user account name can be the same as or different from your login on the client host. Your NQE administrator controls who has access to the database and from which client host.

Note: For information about submitting your request to the NQE database, see Section 4.3, page 56.

If the database user name is different from your local client's login name, you must supply the database user name on each of your client requests.

Note: The target user name of the request will still be the same as your local client login name.

You can specify the database user name in the following ways:

- Select `General Options` on the `Configure` menu of the NQE GUI `Submit` window and enter the name in the `User Name` option field.
- Use the `-u dbuser=` command option of the `cqsub`, `cqstatl`, or `cqdel` command. An example follows:

  ```
  cqsub -u dbuser=henry job
  ```

- Set the `NQEDB_USER` environment variable. An example follows:

  ```
  export NQEDB_USER=henry
  cqsub job
  ```

The following example enables `jack`, who is currently logged in, to become `jjackson` (the owner of the request) and to submit request `job1` to the NQE database as `Chemdept` (no spaces are allowed between the comma and the name of the owner of the request):

```
cqsub -u dbuser=Chemdept,jjackson job1
```

For a complete description of the `-u` option syntax, see the `cqsub`(1) man page.

2.4 NQS Validation Requirements

NQS can perform validation when you submit, monitor, delete, or send a signal to a request. Validation ensures that the user name associated with the request is authorized to submit, monitor, and control the request.

Your NQE administrator specifies the validation method used in your NQS configuration. NQS can also perform validation when the output files produced by a remotely executed request will be returned to your local system. This validation is done to ensure that the user name under which the request was executed has permission to write to your file system. Usually, the same method of validation is used for both local and remote NQS systems.

The following validation methods are possible:

- File validation, which is the default method of NQS validation
- Password validation
- File and password validation combined
- No validation is done. Your site is not likely to use this method; it is not secure and is not recommended.

To display the current method in use, you must log on to your NQS server and issue the following commands:

```
% qmgr
Qmgr: show parameters
```

The last line of this display shows the validation type:

```
Validation type = Validation files
```

2.5 File Validation

File validation is the default method of NQS validation. Validation files are checked for valid users and hosts. This check is performed at the NQS server when it receives a client request and prior to execution on the NQS server on which the request will run. NQS also checks for a validation file at your NQE client system to ensure that the user has permission to write the output files back to your system.

For remote requests to systems running the UNICOS multilevel security feature (MLS) or UNICOS/mk security enhancements, you may not be able to designate the request to be run under a different name. When these features are enabled on your system and you submit a remote request, the system might be configured to require the `/etc/hosts.equiv` and `.rhosts` files to each contain a match for the remote host and require that the remote user and local user names match.

If your site uses validation files, you must have a `.rhosts` or `.nqshosts` file in your home directory on each NQS server in the cluster that might process your request. NQS uses these files to authorize your user name before it sends your request to a batch queue.

At the NQS server, you must have an entry of the following format in one of these files:

hostname username

The *hostname* is the network host name of the system from which you submit the request (the NQE client system). The *username* is your user name on the corresponding host.

If you have both `.rhosts` and `.nqshosts` files, NQS ignores the `.rhosts` file. Unless your NQE administrator gives you different advice, use the `.rhosts` file.

> **Note:** You must have a `.rhosts` or a `.nqshosts` file in your login directory on each NQS server on which your request can run. If your site uses aliases for host names, you also must include those names in the `.rhosts` or `.nqshosts` file entry. See Section 2.8.3, page 32, and Section 2.8.5, page 39, for information about entries in the `.rhosts` file or `.nqshosts` file.

If your site uses aliases for host names, you also must include those names in the file, as in the following example:

```
snow jane
snow.site.com jane
```

2.6 Password Validation

If your site uses password validation, you must supply a password each time you submit, monitor, delete, or send a signal to a request. The password cannot contain more than 8 characters. To ensure that you will be prompted for your password, use one of the following (the password you supply is for the user name under which the request will execute):

- If you use the NQE GUI, select `Set Password` on the `Actions` menu of the `Submit` window; enter and "apply" your password.
- If you use the command line interface, specify the `-P` option when you use the `cqsub`, `cqstatl`, and `cqdel` client commands.
- Set the `NQS_PASSWORD_NEEDED` environment variable.

  When you are prompted for your password, you supply the password for the user name at the NQS server on which the request will execute.

  The NQE client sends the password in an encrypted form to the NQS server when it sends the request. Before the request is executed, the password is checked at the NQS server. If the password is not valid, the request is rejected.

  Note: NQS does not use password validation when sending output files between two NQS systems.

2.7 File and Password Validation

If you use the NQE GUI, you do not need to set a password. The validation file is then checked. If you do not supply a password, NQS checks your validation files. If you supply a password (whether correctly or incorrectly), NQS checks only the password and not the file.

2.8 Validation File Examples

This section describes the following possible scenarios for validation files, as follows:

- Using the same user name when submitting a request on a single-node NQE (Section 2.8.1, page 28)
- Using the same user name when submitting a request to the NQE database on a multiple-node NQE (Section 2.8.2, page 29)

- Using the same user name when submitting a request to NQS_SERVER on a multiple-node NQE using the NLB (Section 2.8.3, page 32)
- Using an alternative user name when submitting a request to the NQE database on a multiple-node NQE (Section 2.8.4, page 36)
- Using an alternative user name when submitting a request to NQS_SERVER on a multiple-node NQE using the NLB (Section 2.8.5, page 39)

2.8.1 Using the Same User Name When Submitting a Request on a Single-node NQE

In this example, snow, frost, and hail are clients submitting requests to rain. rain is the only NQE node in this NQE cluster. User jane is using the client commands or the NQE GUI on her workstation called snow. jane wants to submit her job request to NQS or to the NQE database, both of which reside on the NQE node called rain.

At a minimum, jane must have the following:

- Access to an account (a login ID) on her workstation (snow).
- Access to an account on the NQE node rain.
- jane will be submitting requests to rain from client snow only, not from clients frost or hail. (User jane on the client workstations on frost or hail can be someone else who is also named jane.) For NQS on rain to accept her requests, jane must have a .nqshosts or .rhosts file in her login directory on rain with the following entry:

  ```
  snow jane
  ```

- jane will be receiving output files on snow; therefore, she must have the file ~jane/.rhosts on snow with the following entry specifying that jane at rain is allowed remote access:

  ```
  rain jane
  ```

- Because jane also wants to submit requests to the NQE database, she must have authentication on the NQE database (see Section 2.3, page 24).

Job output will be returned from the NQS server by default to the NQE client, snow, by either FTA or rcp. FTA will be attempted first.

FTA may require a password for the destination host (NQE client snow) and user (user jane at snow), which can be supplied by creating a .netrc file in

the login directory of user jane on rain (~jane/.netrc on rain). (For further information, see the netrc(5) man page).

FTA can also be configured so that jane will not have to supply a password. This configuration in FTA is called network peer-to-peer authorization (NPPA). Check with your system administrator to see if this option is available.

rcp is used only to return output if FTA fails immediately to return the output. rcp requires a .rhosts file at the destination host in the recipient's home directory (~jane/.rhosts on snow).

NQS will always try to use your .nqshosts file and will use the .rhosts file only if the .nqshosts file does not exist. You should use .rhosts files unless your system administrator tells you that you should not use them.

Once she has her .rhosts files in place, jane can submit requests to rain. For example, jane could submit the request named testjob by using either the NQE GUI or the command line interface. If she uses the command line interface, she would enter the following command; the value for *dest_type* can be nqedb (to send a request to the NQE database) or nqs (to send a request to NQS):

```
cqsub -d dest_type testjob
```

For more information about using the cqsub -d option, see Chapter 4, page 49, or the cqsub(1) man page.

2.8.2 Using the Same User Name When Submitting a Request to the NQE Database on a Multiple-node NQE

In this example, user jane is using the NQE GUI or NQE client commands on workstation snow. The NQE database resides on wind. User jane wants to submit requests to the NQE database on wind, where the NQE scheduler will select a target system. To submit requests to the NQE database on wind, jane must have authentication on the NQE database (see Section 2.3, page 24).

In this example, three other NQE nodes exist in the NQE cluster that have the names gust, storm, and rain. This means that jane can potentially run requests on rain, gust, storm, and wind. To use all four nodes, jane must have a .rhosts (or .nqshosts) file in her home directory on each of the four nodes.

Since jane uses the same login ID on all of the NQE nodes, the .rhosts file on snow would contain the following entries:

- On the NQE client workstation snow:

  rain jane (lets jane@rain return output to snow)

  gust jane (lets jane@gust return output to snow)

  storm jane (lets jane@storm return output to snow)

  wind jane (lets jane@wind return output to snow)

  Note: This is required only if rcp is the output mechanism; also, these entries need to be in the .rhosts file. rcp does not use the .nqshosts file.

The .rhosts file for user jane on each NQE node must contain the following entry (note that it is the same entry on each NQE node):

- On node wind:

  snow jane (permits incoming requests from jane@snow)

- On node gust:

  snow jane (permits incoming requests from jane@snow)

- On node rain:

  snow jane (permits incoming requests from jane@snow)

- On node storm:

  snow jane (permits incoming requests from jane@snow)

Once she has her .rhosts files in place, jane can submit requests to wind. For example, jane could submit the request named testjob by using either the NQE GUI or the command line interface. If she uses the command line interface, she would enter the following command:

```
cqsub -d nqedb testjob
```

Once a target system is selected, the LWS on that node authenticates user jane.

Job output will be returned from the NQS server by default to the NQE client, snow, by either FTA or rcp. FTA will be attempted first.

FTA may require a password for the destination host (NQE client snow) and user (user jane at snow), which can be supplied by creating a .netrc file in the login directory of user jane on wind (~jane/.netrc on wind) (if it is executed there). (For further information, see the netrc(5) man page).

FTA can also be configured so that `jane` will not have to supply a password. This configuration in FTA is called network peer-to-peer authorization (NPPA). Check with your system administrator to see if this option is available.

`rcp` is used only to return output if FTA fails immediately to return the output. `rcp` requires a `.rhosts` file at the destination host in the recipient's home directory (`~jane/.rhosts` on `snow`).

NQS will always try to use your `.nqshosts` file and will use the `.rhosts` file only if the `.nqshosts` file does not exist. You should use `.rhosts` files unless your system administrator tells you that you should not use them.

Figure 7 shows how the file validation scenario looks:

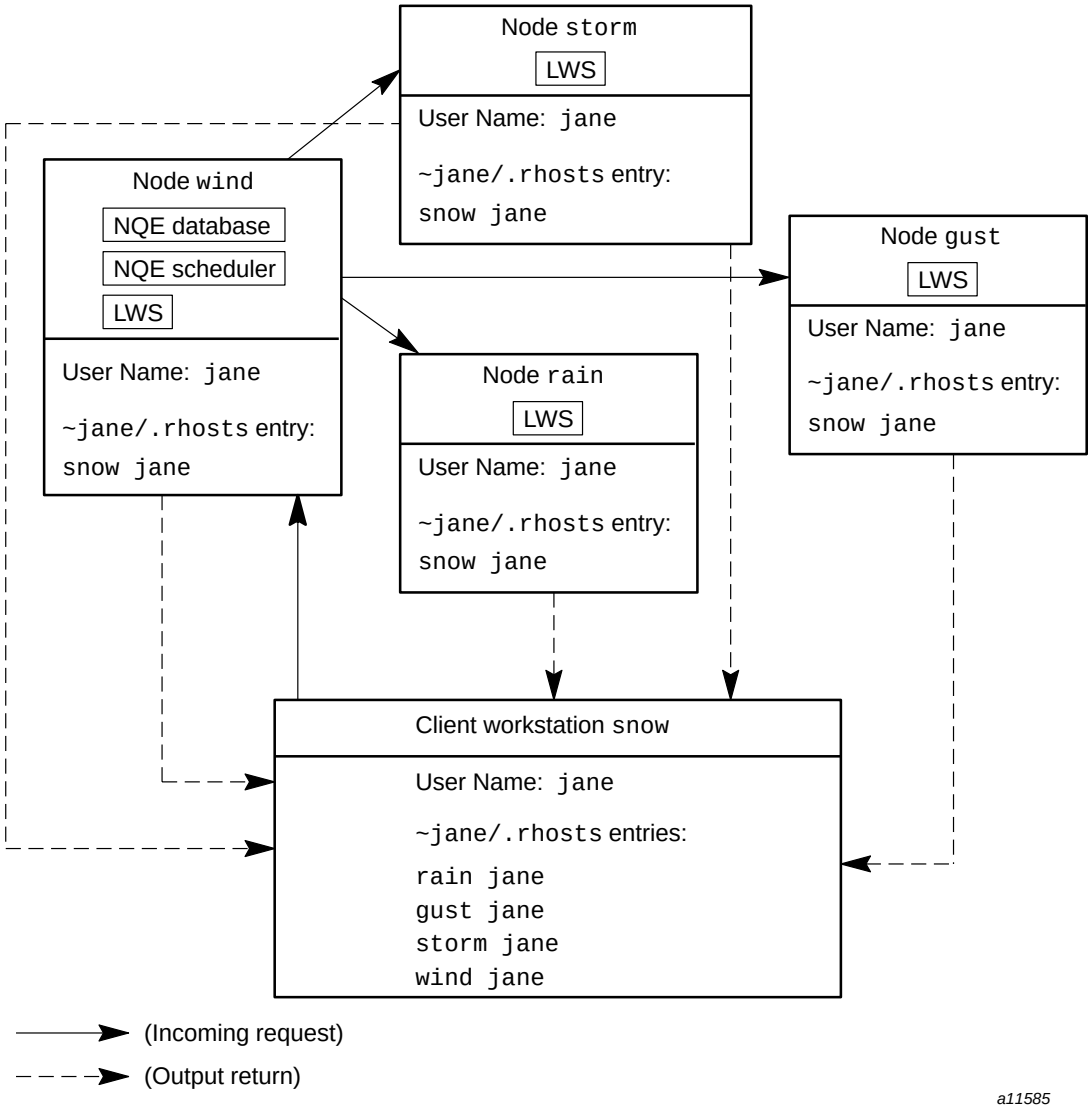


Figure 7. Submitting Request to NQE Database on Multiple-node NQE Using Same User Name

2.8.3 Using the Same User Name When Submitting a Request to NQS_SERVER on a Multiple-node NQE Using the NLB

In this example, user jane is using the NQE GUI or NQE client commands on workstation snow and her NQS server is rain (NQS_SERVER=rain).

User jane wants to submit requests to rain, using load balancing (NLB) to select a target system.

In this example, three other NQS server nodes exist in the NQE cluster that have the names gust, storm, and wind. This means that jane can potentially run requests on rain, gust, storm, and wind. To use all four nodes, jane must have entries in a .rhosts (or .nqshosts) file in her home directory on each of the four nodes. Assuming that jane uses the same login ID on all of the four nodes, the .rhosts files would contain the following entries:

- On the NQE client workstation snow:

  rain jane (lets jane@rain return output to snow)

  gust jane (lets jane@gust return output to snow)

  storm jane (lets jane@storm return output to snow)

  wind jane (lets jane@wind return output to snow)

  Note: This is required only if rcp is the output mechanism; also, these entries need to be in the .rhosts file. rcp does not use the .nqshosts file.

- On node rain:

  snow jane (permits incoming requests)

- On node gust:

  rain jane (accepts requests from rain)

- On node wind:

  rain jane (accepts requests from rain)

- On node storm:

  rain jane (accepts requests from rain)

Once she has her .rhosts files in place, jane can submit requests to her NQS_SERVER rain. For example, jane could submit the request named testjob by using either the NQE GUI or the command line interface. If she uses the command line interface, she would enter the following command:

```
cqsub -d nqs testjob
```

Job output will be returned from the NQS server by default to the NQE client, snow, by either FTA or rcp. FTA will be attempted first.

FTA may require a password for the destination host (NQE client `snow`) and user (user `jane` at `snow`), which can be supplied by creating a `.netrc` file in the login directory of user `jane` on `rain` (`~jane/.netrc` on `rain`) (if it is executed there). (For further information, see the `netrc`(5) man page.)

FTA can also be configured so that `jane` will not have to supply a password. This configuration in FTA is called network peer-to-peer authorization (NPPA). Check with your system administrator to see if this option is available.

`rcp` is used only to return output if FTA fails immediately to return the output. `rcp` requires a `.rhosts` file at the destination host in the recipient's home directory (`~jane/.rhosts` on `snow`).

NQS will always try to use your `.nqshosts` file and will use the `.rhosts` file only if the `.nqshosts` file does not exist. You should use `.rhosts` files unless your system administrator tells you that you should not use them.

Figure 8, page 35 shows how the file validation scenario looks:

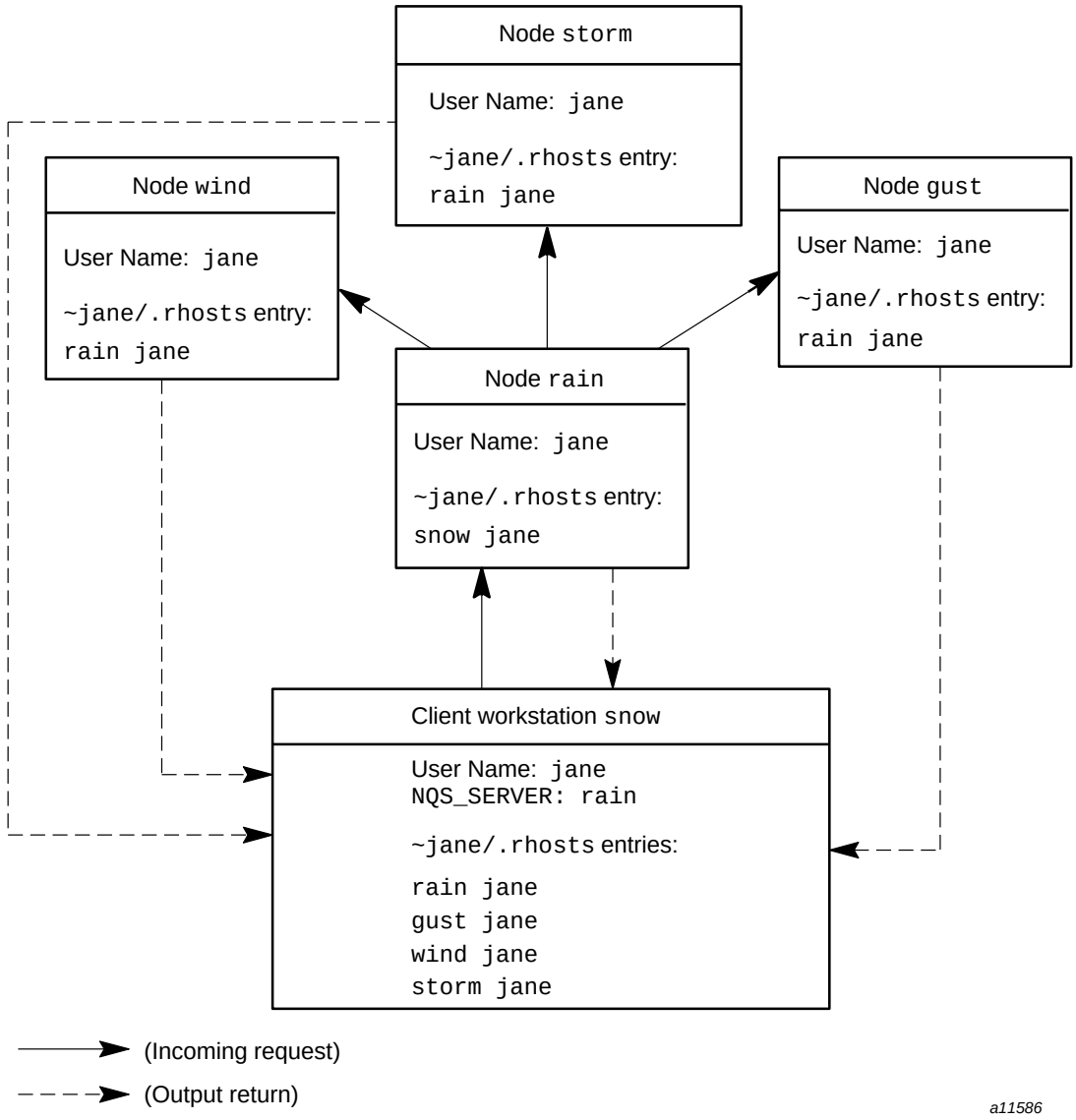


Figure 8. Submitting Request to NQS_SERVER on Multiple-node NQE Using Same User Name

2.8.4 Using an Alternative User Name When Submitting a Request to the NQE Database on a Multiple-node NQE

By default, NQE expects that you have the same user name on all of your NQE nodes. However, you can submit requests to execute under an alternative user name.

In this example, user `jane` is using the NQE GUI or NQE client commands on workstation `snow`. The NQE database resides on `wind`. User `jane` wants to submit requests to the NQE database on `wind` as user `fred`. The NQE scheduler will select a target system.

In this example, three other NQE nodes exist in the NQE cluster that have the names `gust`, `storm`, and `rain`.

For `jane` to use all four NQE nodes as user `fred`, user `fred` must permit `jane` to execute under his account, so `fred` must have a `.rhosts` file in his home directory on each of the four nodes.

By default, job output will be returned from the NQS server to the workstation host, `snow`, by either FTA or `rcp`. (FTA is the default.) User `jane` must allow `fred` to return output to her at the workstation host, `snow`. User `fred` must have write permission to the directory in which the output is returned.

- On the NQE client workstation `snow`, `~jane/.rhosts` would contain:

  `rain fred` (lets `rain` return output to `snow`)

  `gust fred` (lets `gust` return output to `snow`)

  `storm fred` (lets `storm` return output to `snow`)

  `wind fred` (lets `wind` return output to `snow`)

  Note: These entries are required only if `rcp` is the output mechanism; also, these entries need to be in the `.rhosts` file. `rcp` does not use the `.nqshosts` file.

On the NQE nodes, `fred` must have the following entry in his `.rhosts` file (note that it is the same entry on each NQE node):

- On the NQE database node `wind`, `~fred/.rhosts` would contain:

  `snow jane` (permits incoming requests)

- On node `gust`, `~fred/.rhosts` would contain:

  `snow jane` (permits incoming requests)

- On node `rain`, `~fred/.rhosts` would contain:

  `snow jane` (permits incoming requests)

- On node `storm`, `~fred/.rhosts` would contain:

  `snow jane` (permits incoming requests)

Once the `.rhosts` files are in place, `jane` can submit a request to the NQE database as `fred`. For example, `jane` could submit the request named `testjob` as user `fred` by using either the NQE GUI or the command line interface. If she uses the command line interface, she would enter the following command:

```
cqsub -d nqedb -u fred testjob
```

Once a target system is selected, the LWS on that node authenticates user `jane`.

FTA may require a password for the destination host (NQE client `snow`) and user (user `jane` at host `snow`), which can be supplied by creating a `.netrc` file in the login directory of user `jane` on host `wind` (`~jane/.netrc` on `wind`). (For further information, see the `netrc`(5) man page).

In this example of alternative user names, the job request ran as user `fred` and it will be user `fred` trying to return the output back to user `jane` on host `snow`. The `.netrc` file must then be in `~fred/.netrc` on `rain` (if it is executed there) and contain `jane`'s password on `snow`.

FTA can also be configured so that `jane` will not have to supply a password. This configuration in FTA is called network peer-to-peer authorization (NPPA). Check with your system administrator to see if this option is available.

`rcp` is used only to return output if FTA fails immediately to return the output. `rcp` requires a `.rhosts` file at the destination host in the recipient's home directory (`~jane/.rhosts` on host `snow`).

Figure 9 shows how the file validation scenario looks:

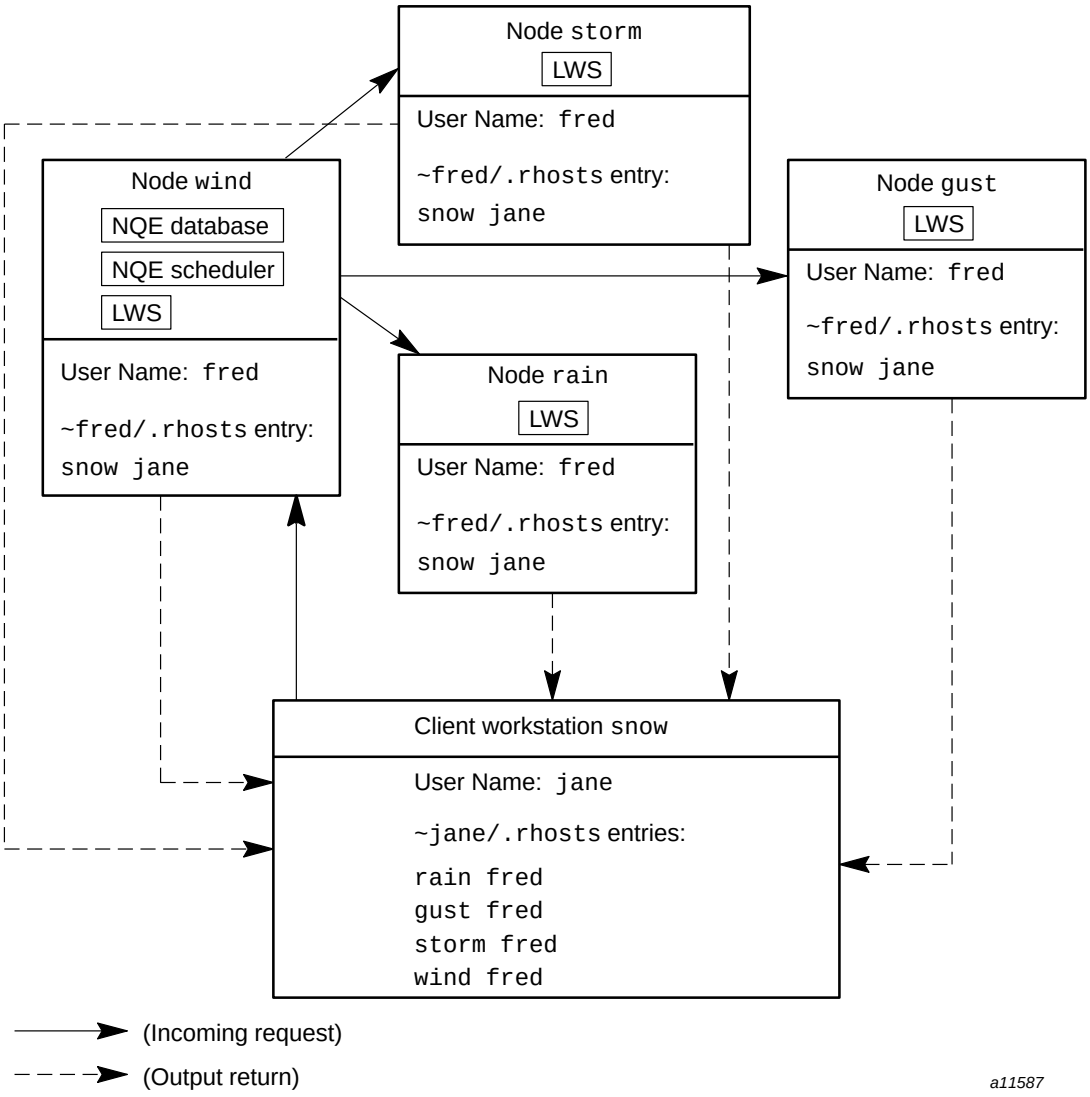


Figure 9. Submitting Request to the NQE Database on Multiple-node NQE Using an Alternative User Name

2.8.5 Using an Alternative User Name When Submitting a Request to NQS_SERVER on a Multiple-node NQE Using the NLB

By default, NQE expects that you have the same user name on your workstation as on your NQS server node. However, you can submit requests to execute under an alternative user name.

In this example, user `jane` is using the NQE GUI or NQE client commands on workstation `snow` and her `NQS_SERVER` is `rain`. User `jane` wants to submit requests to `NQS_SERVER` `rain` as user `fred`.

In this example, three other NQE nodes exist in the NQE cluster that have the names `gust`, `storm`, and `wind`.

For `jane` to use all four NQE nodes as user `fred`, user `fred` must permit `jane` to execute under his account, so `fred` must have a `.rhosts` file in his home directory on each of the four nodes.

By default, job output will be returned from the NQS server to the workstation host, `snow`, by either FTA or `rcp`. (FTA is the default.) User `jane` must allow `fred` to return output to her at the workstation host, `snow`. User `fred` must have write permission to the directory in which the output is returned.

- On the NQE client workstation `snow`, `~jane/.rhosts` would contain:

  `rain fred` (lets `rain` return output to `snow`)

  `gust fred` (lets `gust` return output to `snow`)

  `storm fred` (lets `storm` return output to `snow`)

  `wind fred` (lets `wind` return output to `snow`)

  Note: These entries are required only if `rcp` is the output mechanism; also, these entries need to be in the `.rhosts` file. `rcp` does not use the `.nqshosts` file.

- By default, on `rain`, user `jane` must have an account to permit the incoming request, and user `fred` must permit `jane` to execute under his account. To allow this to occur, the following is required by NQS on `rain`:

  ```
  ~jane/.rhosts:   snow jane

  ~fred/.rhosts:   rain jane
  ```

- On node `gust`, `~fred/.rhosts` must contain:

  `rain fred` (accepts requests from `rain`)

- On node `wind`, `~fred/.rhosts` must contain:

  `rain fred` (accepts requests from `rain`)

- On node `storm`, `~fred/.rhosts` must contain:

  `rain fred` (accepts requests from `rain`)

Once the `.rhosts` files are in place, `jane` can submit a request to her `NQS_SERVER` `rain` as `fred`. For example, `jane` could submit the request named `testjob` as user `fred` by using either the NQE GUI or the command line interface. If she uses the command line interface, she would enter the following command:

```
cqsub -d nqs -u fred testjob
```

FTA may require a password for the destination host (NQE client `snow`) and user (user `jane` at host `snow`), which can be supplied by creating a `.netrc` file in the login directory of user `jane` on host `rain` (`~jane/.netrc` on `rain`). (For further information, see the `netrc`(5) man page.)

In this example of alternative user names, the job request ran as user `fred` and it will be user `fred` trying to return the output back to user `jane` on host `snow`. The `.netrc` file must then be in `~fred/.netrc` on `rain` (if it is executed there) and contain `jane`'s password on `snow`.

FTA can also be configured so that `jane` will not have to supply a password. This configuration in FTA is called network peer-to-peer authorization (NPPA). Check with your system administrator to see if this option is available.

`rcp` is used only to return output if FTA fails immediately to return the output. `rcp` requires a `.rhosts` file at the destination host in the recipient's home directory (`~jane/.rhosts` on host `snow`).

Figure 10 shows how the file validation scenario looks:

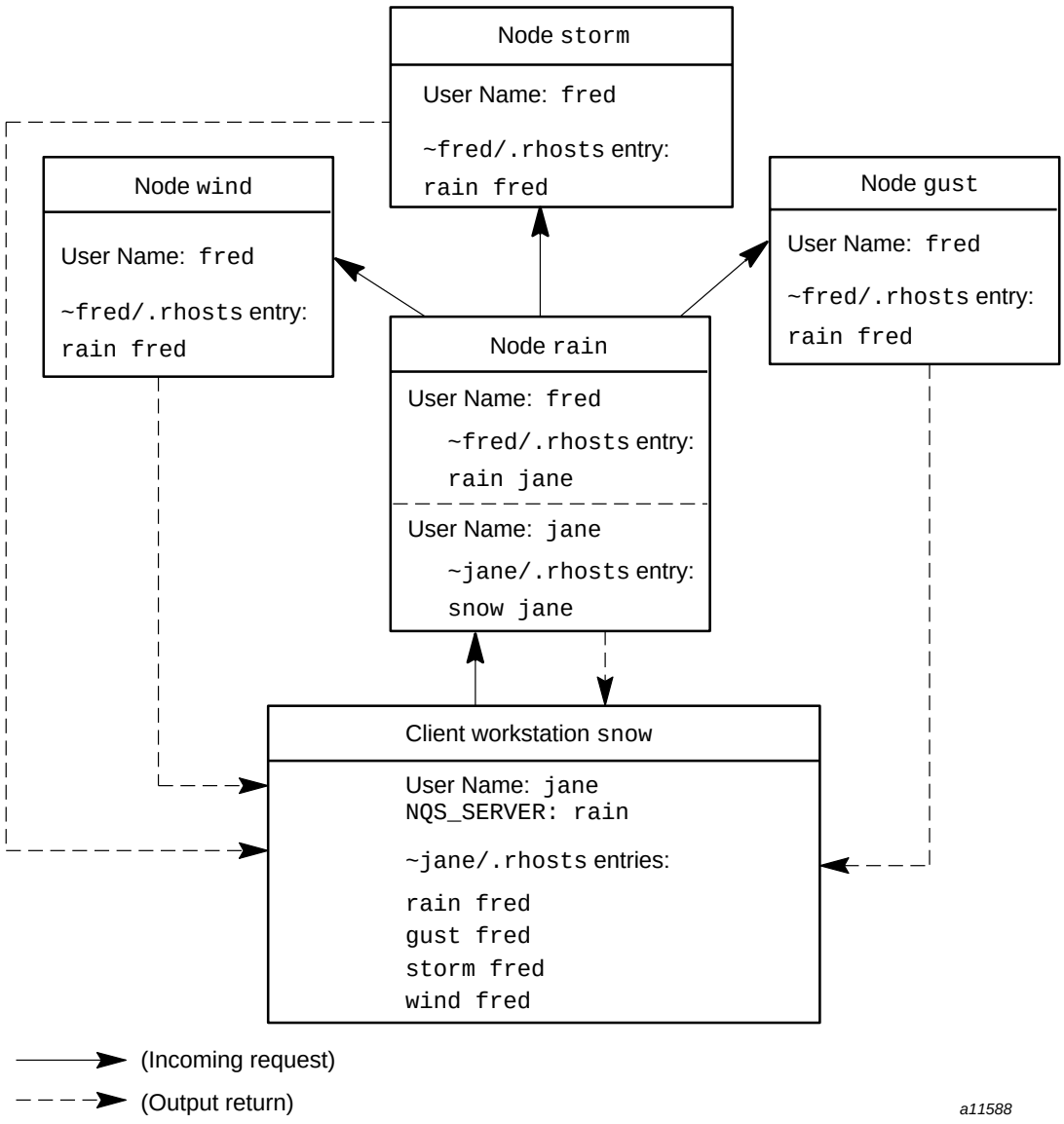


Figure 10. Submitting Request to NQS_SERVER on Multiple-node NQE Using an Alternative User Name

Creating Batch Requests [3]

This chapter describes how you can create batch requests. The following topics are covered:

- What batch requests are (Section 3.1, page 43)
- Creating requests (Section 3.2, page 43)
- Deciding what to include (Section 3.3, page 45)
- Specifying options within requests (Section 3.4, page 45)

Note: To use NQE, you must ensure that environment variables are set as described in Chapter 2, page 21. You also must ensure that NQS validation and NQE database authorization requirements are met as described in Chapter 2, page 21.

3.1 What Are Batch Requests?

A *batch request* is a set of commands submitted to NQE for execution. The request is executed independently of any interactive terminal connection. The batch request is essentially a shell script, but it also can include directions to NQS, file transfer requests, and even your programs.

NQS directives are request submission options that tell NQS how to process your request. They have the same format as `cqsub` options, except that they are preceded by the string `#QSUB`. See Section 3.4, page 45, for a description of NQS directives.

3.2 Creating Requests

You can create a batch request in one of the following ways:

- Put the commands in a file, which is called a *shell script*. You can submit the file by using the NQE GUI `Submit` window, the `cqsub` command, or the `qsub` command.
- Enter your commands in the job edit area of the NQE GUI `Submit` window, and let NQE create the request from these commands.

- Enter your commands at your terminal login prompt, and let NQE create the request from these commands.

The method that you use depends on the purpose of your request. Batch requests often contain work that you want to reproduce. You can put such work in a file and submit it as often as necessary.

Many sites have templates for requests that set the correct parameters for users. To see whether this is true, check with your support personnel.

To create and edit request files, use any UNIX editor (such as `vi`(1)). You can name your files whatever you choose.

To enter commands in the job edit area of the NQE GUI `Submit` window, enter the `nqe` command at your terminal prompt to invoke the NQE GUI, and click on the `Submit` button (using the left mouse button). In the job edit area of the `Submit` window, enter the commands, and then click on the `Submit` action button that is located at the bottom of the window. For detailed information about submitting requests, see Chapter 4, page 49.

To enter commands at your terminal login prompt, enter the `cqsub` or `qsub` command without a batch request file name, enter the commands, and then press `CONTROL-d`, as shown in the following example:

```
% cqsub
ls
date
CONTROL-d
```

Note: When using the command line interface, if you make an error halfway through entering a request and do not find the error until after you have started the next line, you cannot return and correct the error. To terminate the cqsub command and start again, press `CONTROL-c`.

When you submit requests by entering commands in the job edit area of the NQE GUI `Submit` window or at your terminal login prompt, NQS names them `STDIN`. You can change the name of your request. If you use the NQE GUI, select `General Options` of the `Configure` menu on the NQE GUI `Submit` window. If you use the command line interface, use the `cqsub -r` or `qsub -r` command.

If you check the request status, you will see the name of your request. The name of your request also is used in your output file names. For more

information about monitoring the status of your requests, see Chapter 10, page 137. For more information about output file names, see Section 6.1, page 107.

3.3 Deciding What to Include

Your batch request can contain any commands that you can enter when logged in interactively. However, you should keep the following special considerations in mind:

- Many factors participate in determining when your request executes. Including NQS directives in a request can help you control these factors. See Section 3.4, page 45, for a description of the NQS directives.
- You cannot provide input to commands that require an interactive response. Do not put such commands in a batch request, unless you redirect standard input.
- The UNIX shell used to execute NQS batch requests may not be the same as your interactive login shell. Therefore, the results of batch request execution may differ from interactive execution of the commands in the request file. For more information on NQS and shells, see Section 5.3, page 94.

3.4 Specifying Request Options

You can specify options for your request in the following ways:

- If you use the command line interface, you specify `cqsub` or `qsub` command options on the command line. You do not have to include the directives in your batch request file, although you must reenter the options each time you submit the request.
- If you use a batch request file, you can embed the options at the beginning of the file. You must prefix these options by the string `#QSUB`; when they are embedded in a batch request file, these options are referred to as *NQS directives*.

  Note: Options specified through the NQE GUI or command line interface override embedded `#QSUB` *NQS directives*.
- If you use the NQE GUI, you can specify these options by using the `Submit` window `Configure` menu options and then save them to be reused as needed. You do not have to include the directives in your batch request file.

To save the request-related options, select `Save Current Job Profile` on the `Configure` menu of the `Submit` window.

Specifying request-related options gives you the following benefits:

- You can avoid re-specifying options. Many of the options you specify are always required by your request. It is more convenient to define these options once by using the NQE GUI or by embedding them at the beginning of your batch request file so that you do not have to enter them each time you submit the request.

  Examples of such options are as follows:

- You can override these options for unique cases. For example, you may want to specify a time to submit your request during off-peak hours because it less expensive at your site. You can do this in the following ways:

  – Your request's resource requirements (see Section 5.1, page 86)

  – Specific request attributes, such as applications it uses (see Section 4.6, page 60)

  – Which shell to use (see Section 5.3, page 94)

  – The name of a queue you want to use (see Section 5.4, page 96)

  – Output file names and location (see Chapter 6, page 107)

  – Requests for mail when specific events occur (see Section 4.11, page 69)

  – Password prompting if NQS requires it (see Section 5.6, page 97)

  – Another user name for request execution (see Section 5.8, page 99)

  – If you use the command line interface, use the `-a` option on the `cqsub` or `qsub` command line. Options you change on the command line take precedence over any options in the script file.

  – If you use the NQE GUI, use the `Submit` window `Configure` menu `Run After` option. Specify a different time, apply the change, and submit your request. If you do not select `Save Current Job Profile` on the `Configure` menu of the `Submit` window, your changes will not be saved to be reused. Options you indicate on the `Configure` menu of the `Submit` window take precedence over any options in the script file.

If you embed options (NQS directives) in a request file, they must come before the first executable line. Each directive must be on a separate line, and you must prefix each line by the string #QSUB. The following example shows NQS directives embedded in a request file to set the conditions indicated by the comments:

```
#QSUB -eo                                              #merge stdout and stderr
#QSUB -J m                                        #append NQS job log to stdout
#QSUB -o "%fred@gale/nppa_latte:/home/gale/fred/eve.jjob.output"
                  #returnsstdout to fred as eve.jjob.output at the host gale
#QSUB -me                                 #sends mail to submitter at completion
#QSUB                                              #optional qsub delimiter
echo job start
date                                                                 #prints date
rft -user eve -host nppa_latte -nopassword -function get jan.data nqs.data
                           #use FTA to transfer jan.data and name it nqs.data
cc loop.c -o prog.out            #compile loop.c and name executable prog.out
./prog.out                                                    #execute prog.out
rm -f loop.c prog.out jan.data nqs.data                           #delete files
echo job complete
```

If you do not want to embed options (NQS directives) in a request file, use the NQE GUI to select all request-related options. To save the options, select `Save Current Job Profile` on the `Configure` menu of the `Submit` window. If you have an existing file of options (job profile file), you can load the content of that file to be used with your request by selecting `Load New Job Profile` on the `Configure` menu of the `Submit` window.

Submitting Requests [4]

This chapter describes how to submit batch requests to NQS. It discusses the following topics:

- Submitting batch requests:
  - Using the NQE GUI to submit requests (Section 4.1.1, page 51)
  - Using the command line interface to submit requests (Section 4.1.2, page 53)
- Using the NLB default queue for submitting requests (Section 4.2, page 55)
- Submitting a request to the NQE database:
  - Specifying a database user name for your request (Section 4.3.1, page 56)
  - Directing your request to the NQE database (Section 4.3.2, page 57)
- Using DCE/DFS when submitting requests to NQE (Section 4.4, page 57)
- Using security labels when submitting requests (Section 4.5, page 59)
  - Security label for NQS requests submitted locally (Section 4.5.1, page 59)
  - Security label for NQS submitted remotely (Section 4.5.2, page 60)
- Using request attributes:
  - Setting request attributes (Section 4.6.1, page 61)
  - Using request attributes with NQS (Section 4.6.2, page 62)
  - Using request attributes with the NLB (Section 4.6.3, page 62)
  - Using request attributes with the NQE scheduler (Section 4.6.4, page 62)
- Successful submissions:
  - Successful submission to NQS (Section 4.7.1, page 63)
  - Successful submissions to the NQE database (Section 4.7.2, page 64)
- Suppressing informational messages (Section 4.8, page 64)
- Unsuccessful submissions

  - Unsuccessful submissions to NQS (Section 4.9.1, page 65)
  - Unsuccessful submissions to the NQE database (Section 4.9.2, page 66)
- NQS system limits (Section 4.10, page 67)
- Using NQS mail (Section 4.11, page 69)
- Accessing data files (Section 4.12, page 73)
- Obtaining job accounting (Section 4.13, page 75)
- NQS error messages (Section 4.14, page 77)
- Recovery and restart (Section 4.15, page 78)
- Using the request `/tmp` directory (Section 4.16, page 82)

This chapter describes simple request submission; however, over 40 options are available. Generally, you will use some of these options to customize your request so that it executes most effectively.

See Chapter 5, page 85, for a description of commonly used options; Section 5.8, page 99, describes how to specify that a request be run under another user's name.

See Chapter 7, page 113, for a description of how you can communicate with your request while it is executing. See Chapter 6, page 107, for a description of how output files are returned to you and the options you have to control their location and content.

You also can submit DCE work when using NQE; for specific information, see Section 4.4, page 57.

You can submit a request by using either the NQE graphical user interface (GUI) or the command line interface commands `cqsub` or `qsub`. For a summary of the NQE GUI options, see the `nqe`(1) man page. For a full description of the `cqsub` and `qsub` command options, see the `cqsub`(1) and `qsub`(1) man pages.

You can submit a request to either NQS or to the NQE database. By default, your request is submitted to NQS. To submit your request to the NQE database, see Section 4.3, page 56.

Note: To use NQE, you must ensure that environment variables are set as described in Chapter 2, page 21. You also must ensure that validation and NQE database authorization requirements are in place as described in Chapter 2, page 21.

4.1 Submitting Batch Requests

Your system administrator defines the default NQS and NQE database servers and whether your requests will be directed, by default, to NQS or to the NQE database. You can use the default servers and destination, or you can override them.

You can submit requests from your client in the following ways:

- Use the NQE GUI `Submit` window (to invoke the NQE GUI, execute the `nqe` command).
- Use the command line interface `cqsub` *options* command.
- Use the command line interface `qsub` *options* command.

How you override a default node or destination depends on how you submit your request. The following sections describe how to submit requests, including how to override these defaults.

> **Note:** If you submit a request file as a batch request, after you successfully submit it, you can modify the original file without affecting the request that was submitted.

When you submit a request to NQS, and the UNICOS multilevel security (MLS) feature or UNICOS/mk security enhancements are enabled on a remote system, you cannot submit the request to a remote host if that remote host has a workstation access list (WAL) entry for the host of origin that restricts your access to NQS services.

If your NQS requests are on a system that has the UNICOS MLS feature or UNICOS/mk security enhancements enabled, you should execute within your security environment, as defined in the user database (UDB) and the network access list (NAL). See Section 4.5, page 59, for more information.

4.1.1 Using the NQE GUI to Submit Requests

To submit a request to NQE, access the NQE GUI by entering the `nqe` command. The initial NQE GUI button bar window will appear (as shown in Figure 5, page 12). Using the left mouse button, click once on the `Submit` button.

> **Note:** The mouse button settings described in this guide are the default settings.

The following `Submit` window will appear:

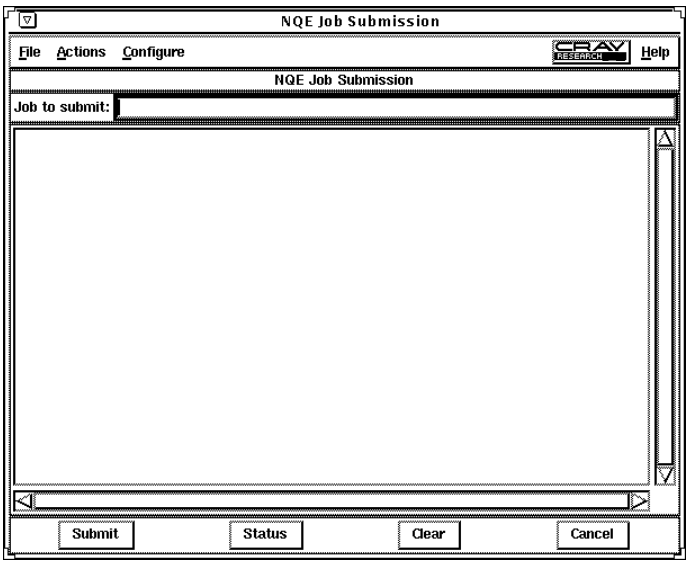


Figure 11. NQE GUI `Submit` Window

The `Submit` window is composed of four sections: the menu bar, the `Job to submit:` line (the job script file), the job edit area, and the actions button bar.

To submit an existing job script file, do the following:

- Either enter the path name of the request file on the `Job to submit:` line and press the `RETURN` key, or select `Open` from the `File` menu (the `Open` option uses a standard Motif file selection interface) and select the request file you want to submit. The request file text appears in the job edit area below the `Job to submit` line.

  You can modify the content of your request file in the job edit area of the `Submit` window. To save changes for future use, select `Save` or `Save As` on the `File` menu.

- You can submit a request directly to NQS or to the NQE database. To set the destination for your request, select either the `Submit to NQE` or `Submit to NQS` on the `General Options` menu, and apply the change. If you do not select this option, the value of the `NQE_DEST_TYPE` environment variable is used, which you can set to be either `nqs` or `nqedb`; otherwise, the value of `NQE_DEST_TYPE` that is set in the `/etc/nqeinfo` file on your `NQS_SERVER` is used.

For additional information about customizing your environment by setting specific environment variables, see Chapter 5, page 85.

For information about using the NLB and default queue when submitting a request to NQS, see Section 4.2, page 55.

For information about submitting a request to the NQE database, see Section 4.3, page 56.

For information about using request attributes when submitting a request, see Section 4.6, page 60.

For information about output options you may want to set before you submit a request, see Chapter 6, page 107.

- If your request will run on a host that uses password validation, use the `Actions` menu to enter your password.
- To submit the request file, click on the `Submit` button that is located at the bottom of the `Submit` window.

  If your request is submitted successfully, you will receive a message similar to one of the following messages:

  – For requests submitted to NQS, you will receive the following message:

    `Request` *number.host* `submitted to queue:`*queue*`.`

  – For requests submitted to the NQE database, you will receive the following message:

    `Task id t`*number* `inserted into database nqedb.`

  For more information about messages received after submitting a request, see Section 4.7, page 63, and Section 4.9, page 65. For information about suppressing this message, see Section 4.8, page 64.

To cancel the `Submit` window, click on the `Cancel` button that is located at the bottom of the `Submit` window.

4.1.2 Using the Command Line Interface to Submit Requests

To use the command line interface to submit a batch request to NQE, use the `cqsub` or `qsub` command. For a complete list of the `cqsub` and `qsub` command options, see the `cqsub`(1) and `qsub`(1) man pages.

Simple forms of the `cqsub` and `qsub` commands are as follows:

`cqsub [`*file*`]`

`qsub [`*file*`]`

The *file* argument is the name of the job script file to be submitted to NQE for execution.

To submit a request directly to NQS, use the `cqsub` or `qsub` command. To submit a request to the NQE database and scheduler, you can use only the `cqsub` command. To set the destination for your request, use the `-d` *dest_type* option; *dest_type* can be `nqs` or `nqedb`. If you do not use the `-d` *dest_type* option, the value of the `NQE_DEST_TYPE` environment variable is used, which you can set to be either `nqs` or `nqedb`; otherwise, the value of `NQE_DEST_TYPE` that is set in the `/etc/nqeinfo` file on your `NQS_SERVER` is used.

For more information about customizing your environment by setting specific environment variables, see Chapter 5, page 85.

For information about using the NLB and default queue when submitting a request to NQS, see Section 4.2, page 55.

For information about submitting a request to the NQE database, see Section 4.3, page 56.

For information about using request attributes when submitting a request, see Section 4.6, page 60.

For information about output options you may want to set before you submit a request, see Chapter 6, page 107.

If your request is submitted successfully, you will receive a message similar to one of the following messages:

- For requests submitted to NQS, you will receive the following message:

  `Request` *number.host* `submitted to queue:`*queue*`.`

- For requests submitted to the NQE database, you will receive the following message:

  `Task id t`*number* `inserted into database nqedb.`

  For more information about messages received after submitting a request, see Section 4.7, page 63, and Section 4.9, page 65. For information about suppressing this message, see Section 4.8, page 64.

After you issue the `cqsub` or `qsub` command, the normal shell prompt appears. You can continue using this session for other purposes. Or, if you want, you can log off. Your request will execute if you are not logged on.

4.2 Using the NLB Default Queue for Submitting Requests

The NLB lets NQE balance the workload of requests across multiple NQS servers. This process is called *load balancing*. To use load balancing, you must submit requests to the destination-selection queue `nqenlb`, which is the system default destination-selection queue (but may be configured differently for your site). Usually, an NLB pipe queue named `nqenlb` exists on each NQS server node.

You can let NQS select a queue for you, or you can specify a queue in which you know you want your request to execute. If you do not specify a queue, NQS initially sends your request to a default queue. The default queue is usually a destination-selection queue. The queue `nqenlb` is the system default destination-selection queue (but may be configured differently for your site).

When you submit a request to a destination-selection queue, NQS queries the NLB to find the most appropriate batch queue to receive the request, based on site-defined policies. The NLB returns a list of the most appropriate queues. The list is ordered beginning with the most appropriate queue choice.

NQS tries to forward the request to the first queue on the list and continues until the request is accepted or until the list is exhausted.

If your site uses file validation, you must have an `.rhosts` or `.nqshosts` file on each system to which a request may be load-balanced. If you receive the No account authorization at transaction peer message, you probably must edit your validation files. For more information on validation, see Chapter 2, page 21.

The following example submits a request to be load-balanced when the default queue is a destination-selection queue:

```
cqsub jobfile1
```

The `jobfile1` file is submitted to NQS, which queries the NLB and then forwards it to a batch queue.

To determine the name of a destination-selection queue, use the `cqstatl -p` or `qstatl -p` command. If nothing is listed in the `DESTINATIONS` column, the queue is a destination-selection queue.

You might not have a default queue; to specify one, see Section 4.9, page 65.

4.3 Submitting a Request to the NQE Database

A request submitted to the NQE database is called a *task*, and it is assigned a unique task identifier (`t`*id*). When you submit a request to the NQE database, the NQE database works with an administrator-defined NQE scheduler to analyze all aspects of your request and determine which NQS server node will receive and process the request.

When the NQE scheduler has chosen a node for your request, the NQE database sends a copy of the request to the batch queue (by default) on the selected NQS server node. The default batch queue is usually named `nqebatch`. The request is assigned an NQS request identifier (*requestid*) and is executed.

Because the original request remains in the NQE database, using the NQE database provides a cluster-wide job rerun capability. If the cluster rerun feature is enabled on your NQE cluster, and if a problem occurs during execution and the copy of the request is lost, a new copy can be submitted.

Your system administrator can modify the NQE scheduler to better meet user requirements and system use needs. For example, the scheduler could be modified so that you could indicate a certain amount of CPU *units* for your request, and the scheduler can interpret *units* differently by machine types in your group of NQS server nodes in the NQE cluster.

4.3.1 Specifying a Database User Name for Your Request

To submit a request to the NQE database, to control a request that was sent to the NQE database, or to get a status of a request that is in the NQE database, you must have a database user `dbuser` account (name) with the proper authorization (user privileges). This database user name may be the same as or different from your UNIX or UNICOS login on the client host. Your NQE administrator controls who has access to the database and from which client host.

If the database user name is different from your local client's login name, you must supply the database user name on each of your client requests.

> **Note:** To delete, to send a signal to, or to get a status of a request, you must have the same database user name that was used to submit the request to the NQE database.

Specify the database user name in the following ways:

- If you use the NQE GUI, select the `General Options` menu in the `Submit` window and enter the name in the `User Name` option field.

- If you use the command line interface, use the `-u dbuser=` command option of the `cqsub` command. An example follows:

  ```
  cqsub -u dbuser=henry job
  ```

- Set the `NQEDB_USER` environment variable. An example follows:

  ```
  setenv NQEDB_USER henry
  ```

To specify that a request be run under another user's name, see Section 5.8, page 99.

4.3.2 Directing Your Request to the NQE Database

To specify that you want your request to the NQE database, you may use one of the following three methods:

- Set the `NQE_DEST_TYPE` environment variable. An example follows:

  ```
  setenv NQE_DEST_TYPE nqedb
  ```

- If you use the NQE GUI, select the `General Options` menu in the `Submit` window. Select `Submit to NQE` and apply your change.

  Note: If you have set the `NQE_DEST_TYPE` environment variable to be `nqedb`, you do not need to select the `Submit to NQE` option. The selected NQE GUI option overrides the `NQE_DEST_TYPE` environment variable or the `etc/nqeinfo` file variable setting.

- If you use the command line interface, use the `-d` *dest_type* command option of the `cqsub` command, and specify `nqedb` as the *dest_type* (destination type). An example follows:

  ```
  cqsub -d nqedb job
  ```

  Note: If you have set the `NQE_DEST_TYPE` environment variable to be `nqedb`, do not use the `-d` *dest_type* option on the command line. The command line option overrides the `NQE_DEST_TYPE` environment variable or the `etc/nqeinfo` file variable setting.

4.4 Using DCE/DFS When Submitting Requests to NQE

When using the Distributed Computing Environment/Distributed File Service (DCE/DFS) to submit requests to NQE, you should note the following:

- The NQE DCE/DFS feature is restricted to operating within a single DCE cell.
- Ticket forwarding is dependent upon the use of the NQE database when submitting tasks. If ticket forwarding is not supported, you must provide a password with the job request if DCE credentials are desired.
- Support for tasks that use forwarded tickets for DCE authentication is provided only on UNICOS, UNICOS/mk, IRIX, and Solaris platforms. Support for tasks that use a password for DCE authentication is available on all NQE 3.3 (or later) platforms. Tickets may be forwarded from any NQE 3.3 (or later) client to any NQE 3.3 (or later) server that supports forwarded tickets as a means of DCE authentication. (Ticket forwarding for either clients or servers is not supported for the Digital UNIX platform in the NQE 3.3 release.)
- NQE supports only the Open Software Foundation (OSF) DCE version 1.1.
- Kerberos is the authentication component of DCE.
- The user password supplied must be the same for both UNIX or UNICOS and the DCE registry password for that user. A user may provide a different DCE registry user name when submitting a request by using the `Submit->General Options->User Name` field or by using the `cqsub -u` or `qsub -u` command. The user password cannot contain more than 8 characters.
- Your home directory can be within DFS space on both UNIX and UNICOS platforms. The request script file can be within DFS space.
- NQS supports DFS path name formats so request output files can be returned to DFS. For information about DFS support for output files, see Chapter 6, page 107.
- After a request completes, NQS uses `kdestroy` to destroy any credentials obtained by NQS on behalf of the request owner.

  On UNIX platforms, there is not an integrated login system feature available. NQS on UNIX platforms obtains separate DCE credentials for request output return. Therefore, including a `kdestroy` within a request script file running on an NQE UNIX server will not affect the return of request output files into DFS space.

Caution: Including the `kdestroy` command within a request script file on UNICOS systems will destroy the credentials obtained by NQS and prevent NQS from returning request output files into DFS space.

- Failure to obtain DCE credentials results in a nonfatal error. The request will be initiated even if the attempt to obtain DCE credentials for the request owner fails. If DCE credentials are successfully obtained, the `KRB5CCNAME` environment variable is set within the request process that is initiated.

  You can use the `klist` command within a request script file to verify that DCE credentials were obtained.

  Note: A restarted job correctly gets the new credentials obtained from NQS, but the `KRB5CCNAME` environment variable within the restart file is not reset to the new cache file name. After the job is restarted, a `klist` within the job script will incorrectly state that there are no credentials. As a result, DCE services are affected but not DFS, which continues to work with the new credentials.

4.5 Using Security Labels When Submitting Requests

If you have NQS requests that are on a system that has the UNICOS multilevel security (MLS) feature or UNICOS/mk security enhancements enabled, you must execute requests within your security environment as defined in the user database (UDB) and the network access list (NAL). This security environment remains the same for the duration of the request; that is, you cannot place the `setucmp`(1) or `setulvl`(1) command in the NQS request to change the environment. The request's security label is determined by your active security label or is set as specified by using either the `cqsub -L` or `qsub -L` command or the `cqsub -C` or `qsub -C` command, or by selecting the NQE GUI `General Options` option on the `Configure` menu of the `Submit` window. To specify the active security level of the request, use the `-L` option; to specify compartments that must be a superset of your active compartments, use the `-C` option.

This section describes how security labels are determined when you submit NQS requests locally and remotely.

4.5.1 Security Label for NQS Requests Submitted Locally

The security label of a locally submitted NQS request is determined as follows:

- If you submit the request by using the `cqsub` or `qsub` command or the NQE GUI `Submit` window (without specifying the `-L` or `-C` option), the request is assigned your active security label when `cqsub` or `qsub` executes.

- When using the `cqsub -L` or `qsub -L` command or specifying an active security level in the `General Options` window, if you specify a security level lower than your active security level, the request is not queued.
- When using the `cqsub -C` or `qsub -C` command or specifying an active security compartment in the `General Options` window, the request is assigned any compartments specified by the command. The specified compartments must be part of your authorized set and must dominate your active compartment set.

In the following example, the user tries to submit a request that has a security level of 0; the active security level is 1. The job is not queued.

```
$ setulvl 1
setulvl: New security label is
Level[1:level1] Compartments[none]
$ qsub -L 0 -eo -o nqs.out request.file
Unanticipated transaction failure at local host.
```

4.5.2 Security Label for NQS Requests Submitted Remotely

The security label of a remotely submitted NQS request is determined as follows:

- If you submit the request by using the `cqsub` or `qsub` command or the NQE GUI `Submit` window (without specifying the `-L` or `-C` option), the request is assigned your default security label as defined in the UDB.
- When using the `cqsub -L` or `qsub -L` command or specifying an active security level in the `General Options` window, if you specify a security level lower than your submission security level, the request is not executed.
- When using the `cqsub -C` or `qsub -C` command or specifying an active security compartment in the `General Options` window, the request is assigned any compartments specified by the command. The specified compartments must be part of your authorized set and must be a superset of your submission compartment set.

4.6 Using Request Attributes

Request attributes are ASCII strings that are to be associated with your request and may be interpreted by the NQE scheduler, the NLB, or NQS.

You may specify zero or more request attributes when submitting a request.

To provide a more efficient or site-specific scheduling, your NQE administrator can configure the NQE database, the NLB, and NQS to interpret the attribute names (and values). This section describes using request attributes.

4.6.1 Setting Request Attributes

Attributes have the following format:

attribute_name [=*value*] [,*attribute_name* [=*value*]

You can set request attributes in the following ways:

- In the NQE GUI by selecting `General Options` on the `Configure` menu of the `Submit` window. Enter the desired attributes (for example `nastran`), and apply your changes and cancel the window. To save the changes, select `Save Current Job Profile` on the `Configure` menu of the `Submit` window.
- On a `cqsub` command line by using the `-la` option. An example follows:

  ```
  cqsub -la "nastran" jobfile
  ```

- For a request being submitted to the NQE database, an example follows:

  ```
  cqsub -d nqedb -la "nastran=2" jobfile
  ```

  The `license` attribute has the value 2. The attributes are stored in the NQE database with other request information.

  The NQE scheduler can use (or ignore) the attributes. If an attribute does not have a value, only the attribute name is stored in the NQE database.

- In a request file by using the `# QSUB -la` option, as follows:

  ```
  # QSUB -la guassian
  ```

- In an `NQSATTR` environment variable, as follows:

  ```
  export NQSATTR="any_scalar_system"
  cqsub jobfile
  ```

4.6.2 Using Request Attributes with NQS

You may specify a list of request attributes when you submit a request to NQS. For example, the following submits the request with script `jobfile` to NQS with the request attributes `nastran` and `big`:

```
cqsub -la "nastran,big" jobfile
```

If you use the NQE GUI to submit a request, select `General Options` of the `Configure` menu in the `Submit` window. Enter the attributes in the `Attribute(s)` field and apply your change.

Note: Your administrator can configure NQS pipe queues and batch queues to reject or accept requests with certain attributes. This gives greater control over the types of request run at a given time.

4.6.3 Using Request Attributes with the NLB

You may specify a list of request attributes when you submit a request to an NLB queue in NQS. For example, the following submits the request with script `jobfile` to the NLB queue, `nqenlb`, with the request attributes `nastran` and `big`:

```
cqsub -q nqenlb -la "nastran,big" jobfile
```

If you use the NQE GUI to submit a request, select `General Options` of the `Configure` menu in the `Submit` window. Enter the attributes in the `Attribute(s)` field and apply your change.

NQS passes the request attributes to the NLB, which can return a list of destinations based on the attributes as well as system load.

Note: If an attribute is not defined in NLB, NQS ignores it. No error message is generated. If the attribute is defined but is not an integer type, NQS generates a log message and the attribute is ignored.

4.6.4 Using Request Attributes with the NQE Scheduler

You may specify not only a list of request attributes but also values associated with the attributes when submitting a request to the NQE database. For example, the following offers an attribute called `nastran` and an attribute called `license`, which has a value of 2:

```
cqsub -d nqedb -la "nastran,license=2" jobfile
```

If you use the NQE GUI to submit a request, select `General Options` of the `Configure` menu in the `Submit` window. Enter the attributes in the `Attribute(s)` field and apply your change.

The `license` attribute has the value 2. The attributes are stored in the NQE database with other request information.

The NQE scheduler can use (or ignore) the attributes. If an attribute does not have a value, only the attribute name is stored in the NQE database.

Note: Request attributes with explicit values (such as `license=2`) are completely ignored by both NQS and NLB.

4.7 Successful Submissions

After your request has been submitted successfully, you will receive a message; the message you receive will depend on which destination you chose for your request (NQS or NQE database). The following sections describe the message you receive.

4.7.1 Successful Submissions to NQS

When your batch request has been submitted successfully to NQS, you will receive one of the following messages:

`Request` *number.host* `submitted to queue:`*queue*`.`

```
nqs-181 qsub: INFO
  Request number.host: Submitted to queue queue by username(userid).
```

This message tells you the following:

- Your request was submitted successfully. If your request cannot enter a queue, you receive an error message.
- Your request received request identifier *number.host*. NQS assigns the unique *number* in sequential order. The *host* is the name of the NQS server that initially processes your request. You can use the request ID to locate or even delete your request.
- Your request entered the specified *queue*. If you do not specify a queue name (see Section 5.4, page 96), your request is submitted to a default queue. From the default queue, your requests usually go to another queue.

- If you used the `qsub` command to submit your request, this message also displays the *username*, which identifies the name of the NQS user who initially submitted the request, and the *userid*, which identifies the user ID of the NQS user who initially submitted the request.

In the following example, a submitted batch request is assigned a request ID of `255.coal`, and it is sent to an NQS queue called `nqenlb`:

```
Request 255.coal submitted to queue: nqenlb.
```

In this example, the NQS server initially processing the request is called `coal`.

4.7.2 Successful Submissions to the NQE Database

When your batch request has been submitted successfully to the NQS database, you will receive the following message:

`Task id t`*number* `inserted into database nqedb.`

This message tells you the following:

- Your request was submitted successfully into the database. If your request cannot enter a queue, you receive an error message.
- Your request received task identifier `t` *number*. The NQE database assigns the unique *number* in sequential order. You can use the task ID to locate or even delete your request.

In the following example, a submitted batch request is assigned a task ID of `t4`, and it is sent to the default NQE database, which is called `nqedb`:

```
Task id t4 inserted into database nqedb.
```

4.8 Suppressing Informational Messages

To suppress the informational message when you submit a request, do one of the following:

- Use the NQE GUI `Submit` window and select `General Options` on the `Configure` menu. Ensure the `Submit Silently` option is selected, and apply your change (click on the `Apply` button) if you need to select it. To save your changes, select `Save Current Job Profile` on the `Configure` menu.
- Use the `cqsub -z` or the `qsub -z` command.

After you issue the `cqsub` or `qsub` command, the usual shell prompt for your session appears. You can continue using this session for other purposes. Or, if you want, you can log off (the request does not require you to be logged on to execute).

Note: NQS copies the file when you submit it and uses this copy as the batch request. After you have successfully submitted a file as a batch request, you can modify the original file without affecting the submitted request.

4.9 Unsuccessful Submissions

If your request is not submitted successfully, you receive an error message that describes the problem. The message you receive will depend on which destination you chose for your request (NQS or NQE database). The following sections describe the message you receive.

For more information about solving problems with request submissions, see Chapter 16, page 223.

4.9.1 Unsuccessful Submissions to NQS

Common reasons for unsuccessful submission to NQS are as follows:

- NQS is not executing. You may receive a message such as the following:

```
Retrying connection to NQS_SERVER host ice (111.111.11.11) ...
Retrying connection to NQS_SERVER on host ice (111.111.11.11) ...
QUESRV:ERROR: Failed to connnect to NQS_SERVER at ice
NETWORK:ERROR: NQS network daemon not responding.
```

  For further advice, contact your local system support staff.

- No default NQS queue is defined. You may receive one of the following messages:

```
CQSUB:ERROR: Failed to submit request to default queue at server ice.
QUESRV: ERROR: No default queue is defined at transaction peer.
```

```
nqs-1019 qsub: CAUTION
  No request queue specified, and no local default has been defined.
nqs-1045 qsub: WARNING
  Request not queued.
```

To define a default queue, do one of the following actions:

– Ask your NQE administrator to define a default queue.

– Define your own default queue by setting the `QSUB_QUEUE` environment variable, depending on the shell you are using, as follows:

  Users of `csh` or `tcsh` can use the following command:

  `setenv QSUB_QUEUE` *queue-name*

  To obtain a list of queue names, use the `cqstatl` command.

  To change an environment variable, you can use the `unset` command if you are using the `sh` or `ksh` shell, or the `unsetenv` command if you are using the `csh` or `tcsh` shell.

– Alternatively, you can explicitly specify a queue by using the NQE GUI or the command line interface (`cqsub -q` or `qsub -q` command). You can use the `-q` option only to specify a queue that your NQE administrator has defined as being able to accept requests directly.

  For more information, see Section 5.4, page 96.

- Access denied at local host. Your NQE administrator can define queues so that they cannot accept requests directly. If this has been done for the queue you specify, your request will be rejected.

4.9.2 Unsuccessful Submissions to the NQE Database

If you are using a client command to talk to the NQE database, and the database server is not up or does not exist, you will see a message such as the following:

```
Connect: Connection refused
NETWORK: ERROR: NQE Database connection failure:
        Can't connect to MSQL server on Latte
```

A client trying to connect to the database without the proper validation will result in an error such as the following:

```
latte$ cqstatl
NETWORK: ERROR: NQE Database connection failure:
         Connection disallowed.
latte$
```

To determine why you cannot connect, check with your database administrator.

4.10 NQS System Limits

Your NQE system administrator can set limits on the NQS system that constrain the maximum number of requests that can be processed concurrently. NQS system limits are important to you because they may affect when (or if) your request will run. For example, if you submit five requests in succession, the last requests probably will not execute immediately because you have exceeded a user run limit.

NQS limits are set on individual queues, queue complexes, and the entire NQS system on a server. A *queue complex* is a set of local batch queues grouped by the NQE system administrator to simplify NQE administration. Each queue complex can have the same set of limits that a single batch queue can have. *global limits* restrict the whole NQS system on a host.

Your NQE administrator can set the limits shown in Table 1 on individual queues, queue complexes, and on the NQS system as a whole.

Table 1. NQS Limits

Limit	Status subcodes	Description
Run	`qr cr gr`	The number of requests that can execute concurrently (regardless of their owner or group) in a queue (`qr`), in a complex (`cr`), or on this NQS server (`gr`). When a queue reaches its run limit (requests will have the substatus `qr`), requests are still routed to the queue, but they remain queued until the number of executing requests falls below the limit.
User	`qu cu gu`	The maximum number of requests a particular user can execute at the same time in a queue (`qu`), in a complex (`cu`), or on this NQS server (`gu`).
Group	`qg cg gg`	The maximum number of requests that users of a particular group can execute at the same time in a queue (`qg`), in a complex (`cg`), or on this NQS server (`gg`).

Limit	Status subcodes	Description
Memory	`qm cm gm`	The maximum total amount of memory available to all requests executing concurrently in a queue (`qm`), in a complex (`cm`), or on this NQS server (`gm`).
MPP processing elements	`qe ce ge`	The maximum number of MPP processing elements (PEs) that can be requested by all requests executing concurrently in a queue (`qe`), in a complex (`ce`), or on this NQS server (`ge`).
Quickfile limit	`qq cq gq`	The maximum number of secondary data segments that can be requested by all requests executing concurrently in a queue (`qq`), in a complex (`cq`), or on this NQS server (`gq`).

To display the current limits, use the commands in Table 2:

Table 2. Commands to Display Limits

Type	Command	Description of display
Queue	`cqstatl -l` or `qstat -l`	Summary of batch queue limits; information can be obtained only if the command is issued to NQS. For an example of this display, see Section 11.3, page 165.
Queue	`cqstatl -f` or `qstat -f`	Details of all queues; information can be obtained only if the command is issued to NQS. Look at the areas `RUN LIMITS` and `RESOURCE USAGE`. For an example of this display, see Section 11.2, page 159.
Complex	`qstat -L`	Summary of queue complex limits. This command works only when you are logged on interactively to your NQS server. To see a list of queue complexes on the server, use `qstat -c`; this command works only when you are logged on interactively to your NQS server.
System	`qmgr show global_parameters`	Global limits for your NQS server. This command works only when you are logged on interactively to your NQS server.

4.11 Using NQS Mail

If you have long jobs that take several hours or more to execute, you can have the system notify you when the request starts and/or completes execution. By default, the mail messages are sent to the user name under which you were logged in when you submitted the request.

Note: Mail is sent only by NQS. For requests submitted to the NQE database, any mail requested is sent by the NQS running the copy of the request. If the cluster rerun feature is enabled on your NQE cluster, it is possible that you will receive multiple mail messages if the request is scheduled more than once because the NQE scheduler performs network cluster rerun.

To specify that you want to receive mail when your request is routed from a pipe queue, when it begins execution, and when it finishes execution, do one of the following:

- Use the NQE GUI `Submit` window and select `Mail Options` on the `Configure` menu. Ensure the `Mail when Job is Routed`, `Mail at Start of Job`, and `Mail at End of Job` options are selected, and apply your changes (click on the `Apply` button) if you need to select any of the options. To save your changes, use the `Save Current Job Profile` option.
- Use the `cqsub -mt -mb -me` command.
- Use the `qsub -mt -mb -me` command.

If you use these options, mail from NQS would appear as follows in your mail queue (this example is from `elm` (1)):

```
N  46 Oct 12 ice_root  (27) NQS request: 59.ice delivered.
N  47 Oct 12 ice_root  (27) NQS request: 59.ice beginning.
N  48 Oct 12 ice_root  (36) NQS request: 59.ice ended.
```

The mail that informs you that your request has been routed from a pipe queue would be similar to the following:

```
Subject: NQS request: 59.ice delivered.

Message concerning NQS request: 59.ice delivered.
Request name:   job2
Request owner: jane
Mail sent at:   09:01:55 CDT
Request sent to local queue destination.

Job log follows:

10/12 09:01:53 Arrived in <nqenlb@ice> from <ice>.
10/12 09:01:54 Arrived in <nqebatch@ice> from <nqenlb@ice>.
10/12 09:01:55 Sending <delivered> mail to <jane>.
```

The mail that informs you that your request has begun execution in a batch queue would be similar to the following:

```
Subject: NQS request: 59.ice beginning.

Message concerning NQS request: 59.ice beginning.
Request name:   job2
Request owner: jane
Mail sent at:   09:01:55 CDT

Job log follows:

10/12 09:01:53 Arrived in <nqenlb@ice> from <ice>.
10/12 09:01:54 Arrived in <nqebatch@ice> from <nqenlb@ice>.
10/12 09:01:55 Sending <delivered> mail to <jane>.
10/12 09:01:55 Sending <beginning> mail to <jane>.
```

The job log at the end of the message records that both mail messages were sent.

The mail that informs you that your request has completed execution in a batch queue would be similar to the following:

```
Subject: NQS request: 59.ice ended.

Message concerning NQS request: 59.ice ended.
Request name:   job2
Request owner: jane
Mail sent at:   09:02:01 CDT
Request exited normally.

_Exit() value was: 0.

Job log follows:

10/12 09:01:53 Arrived in <nqenlb@ice> from <ice>.
10/12 09:01:54 Arrived in <nqebatch@ice> from <nqenlb@ice>.
10/12 09:01:55 Sending <delivered> mail to <jane>.
10/12 09:01:55 Sending <beginning> mail to <jane>.
10/12 09:01:56 Started, pid=<1688>, jid=<1688>, shell=<>, umask=<18>.
10/12 09:01:56 Running in queue <nqebatch>.
10/12 09:01:59 Finished.
10/12 09:01:59 Returning stderr output file.
10/12 09:02:00 Returning stdout output file.
10/12 09:02:01 Sending <ended> mail to <jane>.
```

If the UNICOS MLS feature or UNICOS/mk security enhancements are enabled on your system, you must have your current active label set appropriately to read mail from NQS. If your request has not yet been initiated, mail is sent to you at the job submission label. If your request has been initiated or has completed execution, mail is sent to you at the job execution label.

To request mail when a request is rerun, do one of the following:

- Use the NQE GUI `Submit` window and select `Mail Options` on the `Configure` menu. Ensure the `Mail when Job is Rerun` option is selected, and apply your change (click on the `Apply` button) if you need to select it. To save your changes, use the `Save Current Job Profile` option.
- Use the `cqsub -mr` or `qsub -mr` command.

To request that mail be sent to an alternative user name, do one of the following:

- Use the NQE GUI `Submit` window and select `Mail Options` on the `Configure` menu. Ensure the `Mail User Name` option is selected, and apply your change (click on the `Apply` button) if you need to select it. To save your changes, use the `Save Current Job Profile` option.
- Use the `cqsub -mu` *username* or `qsub -mu` *username* command. By default, the mail messages are sent to the user name under which you were logged in when you submitted the request.

  For a full list of mail message options available through the command line interface, see the `cqsub`(1) or `qsub`(1) man page.

If your request does not complete successfully, you receive either an error message in the standard error file or a mail message that describes the problem.

The following example is the mail you will receive from NQS if your validation is not set up correctly:

```
Message concerning NQS request: 32.latte deleted.
Request name:   STDIN
Request owner: jane
Mail sent at:   17:31:45 CDT
Request could not be routed.

The job you submitted could not be routed to any destination.
Destinations may have been explicitly requested by you, chosen for you
by static pipe queue destinations, or chosen dynamically by the NQE
network load balancer.
```

```
The most typical cause for this kind of problem is account validation.
Check that you have a valid account on the target NQS system(s), and
that you have an entry there in your .rhosts and/or .nqshosts files.

See the nqe man page and User Guide for additional information.

System administrators - Check that NQS MID's (mainframe identifiers)
are correctly set up, so that client and server NQS systems know about
each other. Also, try the nlbpolicy command to look at all of the
possible target hosts for an nqs job, given current system load and
NQE policies. And in the nqs logfile, message nqs-527 also shows what
specific destinations were tried.

Request deleted.

  Last destination queue attempted: <nqebatch@telltale>

Job log follows:
.
.
.
```

This message indicates that the problem probably will be a validation file error. The job log at the end of the message, however, may indicate a different error. You should try to interpret it before calling your local support personnel.

4.12 Accessing Data Files

Your batch request may have to access a data file on the system. For example, you may want to compile a source program file or process a file of data. When a request begins executing, the current directory is the home directory of the user under whom the request is being executed (just as if that user had logged in interactively).

For example, consider the following request, which is a standard shell script that compiles and then executes a Fortran program called `loop.f`:

```
set -x          # Echo commands
ja              # Enable job accounting
date
cd loopdir      # Move to directory where
                # loop.f is stored
```

```
f90 -Zu loop.f  # Compile program loop.f
date./a.out         # Execute program a.out
date
rm loop.o a.out # Remove files
echo job complete
ja -csft        # Report job accounting
                # information and disable job
                # accounting
```

The following two lines are taken from the preceding example. The first line changes the request's current directory to the directory in which `loop.f` is stored; the second line compiles `loop.f`.

```
cd loopdir
f90 -Zu loop.f
```

Another method of accessing a data file is to embed it in the shell script as a `here` document. A `here` document has the following form:

command << 'string'
lines of input
string

The lines of input could be commands or data supplied as standard input to *command*. The *string* line defines the end of the lines of input.

The following example shows the compilation of a Fortran program that is created as a `here` document, and then the subsequent executing of the program by using data that also comes from a `here` document:

```
cat > test.f << 'DELIMIT'
      PROGRAM ADD
C   Read data file to get number of data points to read
C   into an array; add them up and write out the sum
     DIMENSION A(100)
     REAL A, SUM
     INTEGER N
     OPEN (5, FILE= 'DATA')
     READ (5,1) N
1    FORMAT(I3)
     DO 10, I=1,N
     READ (5,2) A(I)
2    FORMAT (F 10.5)
10   CONTINUE
     SUM=0.0
```

```
      DO 20, I=1,N
      SUM=SUM + A(I)
20    CONTINUE
      WRITE(6,3) N, SUM
3     FORMAT (' sum of the ',I3,' numbers is ', G15.5)
       END
DELIMIT
cat > DATA << '*EOF*'
  5
       10.0
       20.0
       30.0
       40.0
       50.0
f90 test.f./a.out
```

In the next example, the `prog` program is executed twice, using two different sets of data:

```
prog << 'EOT'
2.2 8.9
EOT
prog << 'EOT'
8.6 123.4
EOT
```

4.13 Obtaining Job Accounting

If you are running UNICOS or UNICOS/mk, and your system or user profile does not automatically enable job accounting, you can include `ja`(1) commands within your batch request. The `ja` command provides information about the resources used when your request executes. The `ja` command can take several options and arguments, such as the name of a file to contain the report (the default is `$TMPDIR/.jacct`*xxxx*; *xxxx* is the UNICOS or UNICOS/mk job identifier). For a full description of the `ja` command, see the `ja`(1) man page.

In the following example script, the first `ja` command simply turns on job accounting, writing the information to the default file. The second `ja` command (with the `-s` option) writes a report to the standard output file when the script file is executed. When the request completes execution, the contents of the temporary directory `$TMPDIR` (including the `.jacct`*xxxx* file) are deleted automatically.

```
ja
sleep 45
date
pwd
ls
ja -s
```

To view the job accounting report, you can examine the standard output file produced by the execution of the request. For more information about a request's output files, see Chapter 6, page 107. The following output file shows the report produced by running the preceding script. (If the request ran under the C shell, a message written to the start of the output file indicates that the normal C shell job control facilities were not available for this job because it was run in batch mode, rather than from a terminal (tty).)

```
Thu Feb 19 16:09:50 CST 1998
/u/snow
testjob
testjob.e11562
testjob.o11562
tutorial


Job Accounting - Summary Report
===============================

Job Accounting File Name         : /tmp/jtmp.004076a/.jacct1093
Operating System                 : sn1234 xyz 9.2.1bm abc.1 CRAY C90
User Name (ID)                   : snow (10334)
Group Name (ID)                  : crazy (100)
Account Name (ID)                : snow (10334)
Job ID                           : 1093
Report Starts                    : 02/19/98 16:09:04
Report Ends                      : 02/19/98 16:09:50
Elapsed Time                     :           46      Seconds
User CPU Time                    :            0.2327 Seconds
System CPU Time                  :            0.0791 Seconds
I/O Wait Time (Locked)           :            0.0391 Seconds
I/O Wait Time (Unlocked)         :            0.1485 Seconds
CPU Time Memory Integral         :            0.0223 Mword-seconds
SDS Time Memory Integral         :            0.0000 Mword-seconds
I/O Wait Time Memory Integral    :            0.0027 Mword-seconds
Data Transferred                 :            0.1786 MWords
Maximum memory used              :            0.2051 MWords
Logical I/O Requests             :           87
Physical I/O Requests            :          108
Number of Commands               :            6
Billing Units                    :            0.4781
logout
```

4.14 Error Messages

If you are running UNICOS or UNICOS/mk, you may receive an NQS error message while you are using NQS. The NQS user error messages have a group code of `nqs`. To display the explanation of a message, use the `explain`(1) command. For more information, see the `explain`(1) man page. The following example shows NQS error messages and the use of the `explain`(1) command:

```
% qmsg -j -f msg_in 10
nqs-272 qmsg: WARNING
  Error opening file <abc/u0/snow/msg_in>, errno = <13>.
nqs-20 qmsg: WARNING
  Errno <13> = <Permission denied>.
% explain nqs272
Error opening file <file>, errno = <errno>.

NQS tried to use the open(2) system function to open file <file>,
but failed. The reason for the failure is identified by <errno>.
% explain nqs20
Errno <errno> = <error_desc>.

The specified error <errno> has an associated description of <error_desc>.
```

4.15 Recovery and Restart

Note: This functionality is available only on UNICOS, UNICOS/mk, and IRIX systems.

If the operating system is shut down or crashes before the request completes execution, you do not necessarily have to resubmit a batch request because NQS has job recovery capabilities. NQS uses the operating system checkpoint facilities, as follows:

- On UNICOS and UNICOS/mk systems, the `chkpnt`(2) and `restart`(2) facilities are used. On IRIX systems, the `cpr`(2) facility is used.
- When the operating system or NQS is shut down, checkpoint images of all executing requests can be written automatically to a restart file on disk. When the system becomes available, NQS uses the checkpoint image to try to restart each of the requests from the point they had reached in their execution.
- When the operating system or NQS crashes, checkpoint images cannot be written for the executing requests. However, you can include the `qchkpnt`(1) command within a request to cause NQS to write a checkpoint image of the request at particular points in its execution. When the system becomes available after a crash, NQS tries to restart the request from the latest checkpoint image.
- If a request has not yet begun execution at the time of the shutdown or crash, or if no checkpoint image is available, the request remains in its NQS queue and is executed from the start after the system becomes available.

The following two sections describe how you can ensure that your requests take advantage of these recovery facilities, or how to ensure that your request does not use the facilities.

4.15.1 Checkpointing and Restarting

A *checkpoint image* of a request is a copy of the request as it was executing at a particular point in time. A request can be restarted from its checkpoint image, rather than restarting the request from the beginning. If the MLS feature on UNICOS is enabled on your system, however, a checkpointed job cannot be restarted if the job execution label is no longer in the valid range for the job owner and the host of origin.

Checkpoint images can be produced in the following ways:

- NQS automatically checkpoints NQS requests when an operator brings down NQS or the operating system in an orderly manner.
- To protect against unscheduled interrupts, you can use the `qchkpnt`(1) command within a request to write an image of the request to disk when it is executing. This action is particularly appropriate if your request will execute a long time and you are concerned about request recovery across unscheduled interrupts (such as a power outage or a system crash).

In either case, when NQS resumes normal operation, it automatically uses the latest checkpoint image to restart the request if the criteria listed in Section 4.15.3, page 80, are met.

To prevent a checkpoint image being written in either of the preceding situations, use the `-nc` option of the `cqsub` or `qsub` command, or select the NQE GUI `Submit->Configure->General Options->Do not checkpoint` option.

To restart the request from a checkpoint image, even if the files have been modified since the checkpoint image was created, use the `-Rf` option of the `cqsub` or `qsub` command.

4.15.2 Forcing a Checkpoint from within a Batch Request

To force a checkpoint image of a request to be made, include the `qchkpnt` command within the request at suitable places. When the request is executing, a checkpoint image of the request is written whenever the `qchkpnt` command is executed.

The command has no options; the syntax is as follows:

```
qchkpnt
```

You can use the `qchkpnt` command only from within a batch request to checkpoint that request.

The following example shows how you can use the `qchkpnt` command in a request:

```
ja                  # Enable job accounting
date
cd loopdir          # Move to directory where
                    # loop.f is stored
f90 -Zu loop.f      # Compile program loop.f
qchkpnt
date./a.out             # Execute program a.out
date
rm loop.o a.out     # Remove files
echo job complete
ja -csft            # Report job accounting
                    # information and disable
                    # job accounting
```

If an unscheduled interrupt in the NQS system occurs after the compilation of the program, the request is restarted automatically by using the checkpoint image at the line following the `qchkpnt` command. If the unscheduled interrupt occurs during or before the compilation, the request is restarted from the beginning.

If the system administrator shuts down the NQS system in an orderly way when the request is executing, a checkpoint image is written automatically at that time, and it is this image that is used for restarting the request, rather than the one written by `qchkpnt`.

4.15.3 Criteria for Batch Request Recovery

Before NQS can create and use a checkpoint image to restart a request automatically, the request must meet the checkpoint criteria established by the system checkpoint facility.

For more information on the UNICOS and UNICOS/mk checkpoint facilities, see the `chkpnt`(2) and `restart`(2) man pages and *General UNICOS System Administration*, publication SG–2301.

For more information on the IRIX checkpoint facility, see the `cpr`(1) man page and the *Checkpoint and Restart Operation Guide*, Silicon Graphics publication 007–3236–*xxx*.

If these criteria are not met, in some cases, NQS reruns the request from the start; a mail message is sent to you about the problem. In other cases (for example, a process identifier or job identifier of the request has been reused), NQS puts the request in a `WAIT` state and tries the restart at short intervals for a period defined by the NQS administrator; in such cases, no mail messages are sent. If the restart still fails, the request is rerun from the start.

4.15.4 Recovering a Request Terminated by a `SIGRPE`, a `SIGUME`, or a `SIGPEFAILURE` Signal

If a request is terminated through receipt of a `SIGRPE`, a `SIGUME`, or a `SIGPEFAILURE` signal, NQS will requeue the request instead of deleting it, if one of the following attributes applies to your request:

- The request is rerunnable.
- The request is restartable and has a restart file.

By default, each NQS request is both rerunnable and restartable. These defaults can be changed by using the `cqsub -nc` or `qsub -nc` command option, the `cqsub -nr` or `qsub -nr` command option, or the `qalter -r n` and `qalter -c n` command options. The owner of the request can specify the `cqsub`(1) or `qsub`(1) command options and use the `qalter`(1) command to modify the request rerun and/or restart attributes. An NQS administrator can also use the `qalter`(1) command to modify any request's rerun and/or restart attributes.

If NQS requeues your request because it was terminated by either the `SIGRPE`, `SIGUME`, or `SIGPEFAILURE` signal, one of the following messages is written into the system log, the NQS log file, and the job log file:

```
Request <1.subzero>: Request received SIGRPE or SIGUME signal; request requeued.

Request <1.subzero>: Request received SIGPEFAILURE signal; request requeued.
```

A requeued request is reinitiated after it is selected by the NQS scheduler. An NQS administrator can use the `qmgr schedule request now` command to force the request to be reinitiated immediately.

4.15.5 Forcing a Request to Be Restarted from the Beginning

To force NQS to restart a request from the beginning rather than from a checkpoint image, submit the request by using the `cqsub -nc` or `qsub -nc` command option, or select the NQE GUI `Submit->Configure->General Options->Do not checkpoint` option. This option prevents NQS from taking a checkpoint image if the administrator shuts down NQS; it also prevents any `qchkpnt` commands within the request from writing any checkpoint images.

You may want to use the `-nc` option, for example, if you know that your request has some inherent limitation that prevents job recovery. For a list of possible limitations, see Section 4.15.3, page 80. Alternatively, you may want to use the `-nc` option to ensure that your request starts and runs to completion with no interrupts.

4.15.6 Preventing a Request from Being Rerun from the Beginning

If you want to prevent NQS from rerunning from the beginning a request that had already started execution when NQS was interrupted, you must include the `-nr` option of the `cqsub` or `qsub` command, or select the NQE GUI `Submit->Configure->General Options->Do not rerun` option when the request is submitted. If this option is used **and** if either the request could not be checkpointed (for example, at shutdown time) or could not be restarted (for example, when the system is rebooted), the request is terminated, thereby preserving any partial output generated by the request.

You also can use the `-nr` option to preserve output from a job when an unscheduled interrupt occurs, rather than have the job restart from the beginning.

4.15.7 Retaining Queued Batch Requests Across Crashes and Shutdowns

If a request was not executing when the NQS system was interrupted (either in a scheduled way by the system administrator or because of a system crash), the request is retained in its queue and is automatically available for execution when NQS becomes available.

4.16 Using the Request `/tmp` Directory

A temporary directory is available to batch requests for the duration of their execution. Each batch request has its own unique temporary directory. When

the batch request completes execution, or aborts with an error, NQS deletes the directory, along with any files contained in the directory.

Typically, temporary directories are created within the `/tmp` directory, although this depends on your site configuration. The name takes the form `nqs.`*xxxxx* (*xxxxx* is any unique string). The name of the directory is available to a batch request in the `TMPDIR` environment variable.

You can use the temporary directory to hold intermediate files generated by your request that are not required when the request ends.

In the following example script file, the source program and executable file created by the `cc` compilation line are written to `$TMPDIR`. After the request completes execution, these files are deleted automatically, along with the temporary directory.

```
cd $TMPDIR
pwd
cat <<EOF > test.c
main () {
.
program
.
}
EOF
cc -o test test.c
ls -la
./test
```

Customizing Requests [5]

This chapter describes the more common options you can use to customize your request. The following topics are covered:

- Using resource limits (Section 5.1, page 86)
  - Example of using limits (Section 5.1.1, page 88)
  - Why you use limits (Section 5.1.2, page 89)
  - Types of limits (Section 5.1.3, page 89)
  - Determining resources (Section 5.1.4, page 89)
  - Consequences of exceeding resource limits (Section 5.1.5, page 91)
- Specifying time limits (Section 5.2, page 91)
- Specifying a shell (Section 5.3, page 94)
- Specifying an NQS queue (Section 5.4, page 96)
- Specifying a request name (Section 5.5, page 97)
- Using password prompting (Section 5.6, page 97)
- Selecting an account name or project name under which to execute the request (Section 5.7, page 98)
- Using alternative user names (Section 5.8, page 99)
- Using request priority (Section 5.9, page 100)
  - Preexecution priority (Section 5.9.1, page 100)
  - Execution priority (Section 5.9.2, page 101)
- Submitting requests to the IRIX Miser scheduler (Section 5.10, page 102)
  - Miser resource reservation options for the `qsub` and `cqsub` commands (Section 5.10.1, page 103)
  - Effect of specifying Miser resource options on request limits (Section 5.10.2, page 104)

For information on options that let you customize NQS mail, see Section 4.11, page 69.

For information on options that let you customize output files, see Chapter 6, page 107.

For information on using and setting request attributes, see Section 4.6, page 60.

For information on using NQS environment variables, see Section 9.1, page 127.

Note: Options specified by using the NQE GUI or command line interface override embedded #QSUB *NQS directives*.

5.1 Using Resource Limits

Each batch request receives a limited amount of system resources, such as CPU time and memory. Certain platforms may enforce only a subset of limits. To determine which limits are enforced on your NQS server, use the following command:

```
qlimit
```

Note: You must issue all NQE commands that begin with q on an NQS server; the NQE commands that begin with q are not NQE client commands. See Section 1.3.2, page 14, for a list of the commands that are available from remote NQE clients.

The following display shows the results of this command on a workstation:

```
% qlimit
  Per-process core file size           -lc
  Per-process data segment size        -ld
  Per-process permanent file size      -lf
  Per-request permanent file size      -lF    Not run-time enforceable
  Per-process memory size              -lm    Not run-time enforceable
  Per-request memory size              -lM    Not run-time enforceable
  Nice value                           -ln
  Per-process quick file size          -lq    Not run-time enforceable
  Per-request quick file size          -lQ    Not run-time enforceable
  Per-process stack segment size       -ls
  Per-process CPU time                 -lt
  Per-request CPU time                 -lT    Enforced per-process
  Per-request tape drive type a        -lUa   Not run-time enforceable
  Per-request tape drive type b        -lUb   Not run-time enforceable
  Per-request tape drive type c        -lUc   Not run-time enforceable
  Per-request tape drive type d        -lUd   Not run-time enforceable
  Per-request tape drive type e        -lUe   Not run-time enforceable
  Per-request tape drive type f        -lUf   Not run-time enforceable
  Per-request tape drive type g        -lUg   Not run-time enforceable
  Per-request tape drive type h        -lUh   Not run-time enforceable
  Per-process temporary file size      -lv    Not run-time enforceable
  Per-request temporary file size      -lV    Not run-time enforceable
  Per-process working set size         -lw
  Per-request MPP processing elements  -l mpp_p=<integer>
                                              Not run-time enforceable
  Per-process MPP time                 -l p_mpp_t=[[hrs:]min:]sec[:msec]
                                              Not run-time enforceable
  Per-request MPP time                 -l mpp_t=[[hrs:]min:]sec[:msec]
                                              Not run-time enforceable
  Per-process MPP memory size          -l p_mpp_m=<integer>
                                              Not run-time enforceable
  Per-request MPP memory size          -l mpp_m=<integer>
                                            Not run-time enforceable
  Per-request shared memory limit      -l shm_l[imit]=<value>[<units>]
                                              Not run-time enforceable
  Per-request shared memory segments   -l shm_s[egments]=<integer>
                                              Not run-time enforceable
```

You can specify resource requirements for your request by using either the NQE GUI or the command line interface.

If you use the NQE GUI, use the `Submit` window and select `Job limits` on the `Configure` menu.

If you use the command line interface, use the options to the `cqsub` command that begin with the letter *l* (for *limit*).

For an example of using limits, see Section 5.1.1, page 88.

When you specify a resource limit, NQE sends your request to a queue that can accommodate the limits you set.

If your resource limits exceed the limits of every possible batch queue destination, your request will not be accepted into a batch queue and therefore will not execute. You will receive a mail message that explains the problem.

You also can send your request directly to a queue that you know has the appropriate limits. To list the resource limits on all of the batch queues on your NQS server, use the following command:

```
cqstatl -b -d nqs -f
```

To list resource limits on another server, use the following command:

`cqstatl -b -d nqs -f -h` *servername*

5.1.1 Example of Using Limits

The following example specifies that request `bigloop` be executed with a memory requirement of 10 Mbytes and a CPU time limit of 1000 seconds:

- To specify the options by using the NQE GUI, use the `Submit` window and select `Job limits` on the `Configure` menu. In the `Request Limit` column, enter 10 mb for the `Memory size` option, enter 1000 for the `CPU Time Limit` option (the default time-limit unit is seconds), and apply your entries (click on the `Apply` button). To save your changes, use the `Save Current Job Profile` option.
- To specify the options by using the command line interface, use the `cqsub` or `qsub` command, as in the following example:

  ```
  cqsub -lM 10mb -lT 1000 bigloop
  ```

- To specify the same options in the request, use the following NQS directive:

  ```
  #QSUB -lM 10mb -lT 1000
  ```

5.1.2 Why You Use Limits

You may want to specify resources for the following reasons:

- You get enough resources. If your request runs out of memory or CPU time, it will abort.
- You get the correct priority. NQS is commonly configured so that requests that specify less memory or CPU time have a higher priority than those specifying more memory or CPU time. For more information about the items that affect the priority of an NQS request, see Section 5.9, page 100.
- You can use more than the defaults. Each NQS batch queue has default request resource limits. If you do not request resources by using options, your request inherits the default resource limits of the batch queue it enters.
- If limits are not set on the batch queue, your request inherits the compiled defaults of your NQS system. If the default limits do not provide adequate memory or CPU time for your request, the request aborts.

5.1.3 Types of Limits

You can set both per-request and per-process limits. *Per-request* limits apply to the sum of the resources used by all processes that the request starts. *Per-process* limits apply to individual processes started by a request. These limits include the parent shell and each command executed.

For example, the per-request memory size limit specifies the total amount of memory used by all processes that the request starts. The per-process memory size limit is the maximum amount of memory that each process can use.

You must specify sufficiently large limits for both the per-request and per-process limits; otherwise, the request may be routed to a queue with inappropriate resources. It may abort when it tries to exceed limits imposed by the queue.

Your request may be routed inappropriately if you specify one type of limit (per-process or per-request), but the NQS batch queues are configured based on the other type of limit.

5.1.4 Determining Resources

To display the resource limits associated with a request, click twice on the request in the NQE GUI `Status` window.

You also can receive the same display by using one of the following commands. To display resource limits associated with a request in NQS, use the `cqstatl` command or the `qstat` command, as in the following examples:

```
cqstatl -d nqs -f requestid
```

```
qstat -f requestid
```

The *requestid* argument is the request identifier displayed when you submitted the request.

You can also specify these commands to monitor the actual resources used by a request and the resources available, which enables you to determine whether the request is close to exceeding resources or whether the resources requested for the request greatly exceed those required.

If you do not request resources by using `cqsub` or `qsub` command options, NQS will assign limits for most resources for the request, using the limits defined by the UNICOS user database (UDB) or the default limits of the batch queue in which the request executes (whichever is the most restrictive). If you do not request any of these resources, the default limits for tapes, quickfile spaces, MPP processing elements (PEs), and shared memory size and segment limits is 0. To display the limits that are currently assigned to queues, use the `cqstat -f` or `qstat -f` command (see Section 11.2.2, page 162), or select the NQE GUI `Status->Actions->Detailed Job Status` option. To view your UDB resource limits, use the `udbsee`(1) command.

To display resource limits associated with a request in the NQE database, use the `cqstatl` command, as follows:

```
cqstatl -d nqedb -f tid
```

The resulting display includes a `RESOURCE USAGE` section that displays the per-process and per-request resource limits. It also shows the resources actually used by the request if it is running. For further information, see Section 10.2.2, page 146.

You can obtain the same resource display from within a batch request by using the `QSUB_REQID` environment variable, as follows:

```
qstat -f $QSUB_REQID
```

For further information about the NQS environment variables available to requests, see Section 9.1, page 127.

5.1.5 Consequences of Exceeding Resource Limits

If your request exceeds resource limits, errors or unexpected results can occur. If an error occurs, your request proceeds with the next command; therefore, you should examine the return values from commands and calls executed within a request to check whether an error has occurred. Within a shell script, you can check the exit status of the last command executed by examining the `status` variable for scripts executing under the C shell or the `?` variable for scripts executing under the standard or Korn shell.

5.2 Specifying Time Limits

You can specify a time after which a request will run. This can be a very useful option, especially if it is less expensive to run your requests during off-peak hours. The request waits in an NQS queue until the time you specify is passed. NQS schedules the request for execution as soon as possible after the specified time.

To specify a time after which to run your request, you can use either the NQE GUI or the command line interface, as follows:

- Use the NQE GUI `Submit` window and select `General Options` on the `Configure` menu. For the `Run After` option, enter the date and time after which you want your request to run, and apply your entry (click on the `Apply` button). To save your changes, use the `Save Current Job Profile` option.
- If you use the command line interface, use the `cqsub` or `qsub` command, as in the following example:

  `cqsub -a` *date_time*

You can specify date and time, as follows:

[*date*][*time*] [*time-zone*]

If you omit *date*, the current day is assumed. The date can be the words `today` or `tomorrow`, or an actual date.

You can specify an actual date for *date* in one of the following ways:

DD-Month	*MM/DD*	*Month DD*	*YYYY MM/DD*
DD-Month-YY	*MM/DD/YY*	*Month DD YYYY*	*YYYY-MM-DD*
DD-Month-YYYY	*MM/DD YYYY*		*YYYY Month DD*
DD-Month YYYY			*YYYY DD-Month*

MM is the number of the month, such as 11. *Month* is the name of the month, which you can abbreviate to a minimum of the first 3 characters. *Month* can be in any combination of uppercase or lowercase. Any of the following are valid: March, MARC, MaR, mar, or MAR.

DD is either the name of the day or the number of the day within the month. You can abbreviate the name of the day to a minimum of the first 3 characters, and it can be in uppercase or lowercase. Any of the following are valid: MOND, mon, Mon, or 23.

YY is the last 2 digits of the year within the current century. *YYYY* is the full year. Any of the following are valid: 98 or 1998.

The *time* can be the word `noon` or `midnight`, or an actual time, specified as follows:

hour`[:`*minutes*`[:`*seconds*`]][`*meridian*`]`

Only the hour is required. A 24-hour clock is assumed, unless you specify *meridian*. The meridian can be `am`, `pm`, or `m` (indicating noon).

The *time-zone* is specified as any North American time zone (such as CDT) or Greenwich mean time (GMT). If you omit *time-zone*, the local time zone is used.

A change in time zones may occur from the time that you submitted the job to the time that the job runs. For example, your time zone may change from standard time to daylight savings time, or the job may be sent from a machine in one time zone to a machine in another time zone. In such cases, you can specify the desired time zone of the request. For example, to run a job at 12:00 P.M. on December 1, you can specify the time zone as follows:

```
"01-December-1995 noon CST"
```

Note: If you use the command line interface, the `-a` option must precede date and time specifications; such as, `cqsub -a "01-December-1995 noon CST"`.

If the date and time specification includes space characters, you must enclose it within single or double quotation marks.

The following are examples of valid date and time specifications:

```
"July 4, 2026 12:31 EDT"
"01-Jan-1995 12am, PDT"
"Tuesday, 23:00:00"
"11pm tues."
'tomorrow 23 GMT'
12:00
noon
12m
```

If you specify `-a 12pm`, your job will run at 12:00 P.M. or 24:00:00. If you want your job to run at 12:00 A.M. or 12:00:00 (noon), use one of the following time specifications:

```
-a 12:00
-a noon
-a 12m
```

When your request is waiting for the time you specified to pass, the `Status` column in the NQE GUI `Status` window will indicate it is waiting with a `WAITING` or a `W` status code. Figure 12 shows an example.

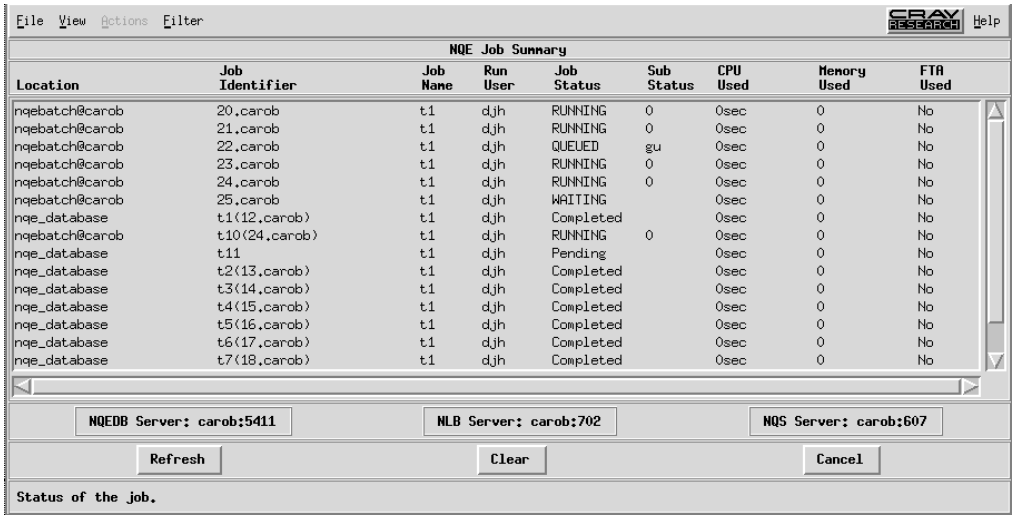


Figure 12. Waiting Request Example

After the time has passed, the status code will change to an `R`, indicating that the request is running.

5.3 Specifying a Shell

NQS uses a two-shell invocation method by default. When you submit a batch request to NQS, you can use the `cqsub -s` or `qsub -s` command to specify the full path name of the first shell used to interpret your request's shell script. You can specify the `csh`, `ksh`, or `sh` shell names. If no shell is specified with the `-s` option, NQS uses your default login shell. If you want to specify another shell, you can specify it in the following two ways:

- Use the NQE GUI `Submit` window and select `General Options` on the `Configure` menu. For the `Shell` option, enter the full path name to the shell you want to use, and apply your entry (click on the `Apply` button). To save your changes, use the `Save Current Job Profile` option.
- Include the following command as the first line of the request file (before any `#QSUB` directives):

  `#!` *shell_path*

The *shell_path* argument is the full path name to the shell you want to use (such as `/bin/csh`). You can include shell options on this line.

NQS sets the `QSUB_SHELL` environment variable to the shell that you were in when you executed the `-s` option. NQS sets the `SHELL` environment variable to the initial shell that was executed by NQS.

When NQS initiates a request, a second shell is spawned. The second shell invoked is always `/bin/sh`, unless you have specified another shell. The two-shell invocation method allows `stdin` read-ahead by commands such as the `remsh`(1B) and `cat`(1) commands.

If you use `csh` or `tcsh` and do not specify the shell as the first line of the request file, NQS will run the batch request under `sh`. This is normal `csh` behavior and is documented in the `csh`(1) man page.

Note: When NQS reads your `.cshrc` file or your request script file, it may encounter commands it cannot invoke and cause your request not to run. You will see these problems reflected in your standard error file.

To specify that NQS invoke just one shell, use the following command (for each request) to set the `NQSCHGINVOKE` environment variable to `true` or `yes` (this example uses `csh` syntax):

```
setenv NQSCHGINVOKE true
```

If `NQSCHGINVOKE` is set to `true` or `yes`, and you do not request a shell by using the `-s` option, NQS invokes the request owner's UDB shell.

To export environment variables when you submit the request, use one of the following methods:

- You can use the NQE GUI `Submit` window and select `General Options` on the `Configure` menu. Ensure the `Export ENV Variables` option is selected, and apply your change (click on the `Apply` button) if you need to select it. To save your changes, use the `Save Current Job Profile` option.
- You can use the `cqsub -x` or `qsub -x` command to export environment variables.

For a discussion of the passing of environment variables to a batch request, see Section 9.1, page 127.

Note: NQS sets an environment variable called `ENVIRONMENT` to value `BATCH` for each NQS initiated job. This variable can be checked within a `.profile`, `.login`, or `.cshrc` script and be used to differentiate between interactive and batch sessions; this action can be used to avoid performing terminal setup operations for a batch job. A benefit of NQS initiating the batch job as a login shell is that `.profile`, `.login`, or `.cshrc` scripts are run and your environment is set up as expected.

5.4 Specifying an NQS Queue

The NQE administrator can define a default queue that applies to all NQS users. You also can define a default queue for your own use in the following ways:

- Use the NQE GUI `Submit` window and select `General Options` on the `Configure` menu. For the `Queue name` option, enter the name of the default queue you want to use, and apply your entry (click on the `Apply` button). To save your changes, use the `Save Current Job Profile` option.
- Use the `cqsub` command or the `qsub` command and the name of the queue. For example, to submit the request file `sleeper` to an NQS queue called `big`, use the following command:

  ```
  cqsub -q big sleeper
  ```

- Set the `QSUB_QUEUE` environment variable to the name of the queue; for example, to set the default NQS queue called `big`, use the following command:

  ```
  setenv QSUB_QUEUE big
  ```

To display the name of the system default queue, use the following command on your NQS server:

```
% qmgr
Qmgr: show parameters
show parameters

  Checkpoint directory = /nqebase/3.0/ice/database
/spool/private/root/chkpnt
  Debug level = 1
  Default batch_request queue = nqenlb
```

If no default queue is defined, or if you want to use a queue other than the default, specify the name of the queue you want to use.

Your NQE administrator can define queues so that they cannot accept requests directly. If this has been done for the queue you specify, your request will be rejected. To determine whether a batch queue can accept requests, you can use the `cqstatl -f` command or `qstat -f` command, as in the following example:

```
cqstatl -d nqs -f queue
```

The section of the display under the `<ACCESS>` heading lists whether the `Route` is `Unrestricted` or `Pipe Only`. For details about using the `cqstatl -f` command or the `qstat -f` command, see Section 11.2, page 159.

5.5 Specifying a Request Name

Unless you specify a request name, your request inherits the name of the request file. To specify a name for a request, do one of the following:

- If you use the NQE GUI, enter the name of the request on the `Job to submit:` line of the `Submit` window.
- If you use the `cqsub` command or the `qsub` command, use the `-r` option as in the following example:

  ```
  cqsub -r requestname
  ```

The request name is used in status displays and in naming your output files, unless you specify another name for your output file. For information about specifying output files, see Chapter 6, page 107.

5.6 Using Password Prompting

If your NQE administrator has used password validation as a method of authorizing users, you can ensure that you always provide a password when needed. You can specify that you want to be prompted for a password in the following ways:

- Use the NQE GUI `Submit` window and select the `Set Password` option of the `Actions` menu.
- Use the `cqsub -P` command.

- Set the NQS_PASSWORD_NEEDED environment variable to ensure you are prompted. You can set the NQS_PASSWORD_NEEDED environment variable to be any value (ON, YES, TRUE, 0, etc.); the presence of the NQS_PASSWORD_NEEDED environment variable ensures that you are prompted for your password.

  Note: If you set the NQS_PASSWORD_NEEDED environment variable outside of the NQE GUI and then use the NQE GUI to submit a request, you will be prompted to set your password.

5.7 Selecting an Account Name or Project Name under Which to Execute the Request

To specify an alternative UNICOS account name or the IRIX project name under which your request will be executed, you can use either the cqsub -A or qsub -A command, or select the NQE GUI Submit->Configure->General Options window. For example, if you currently are logged in as user pat, and the current UNICOS account name of your interactive session is dept_a (as shown by using the newacct -l command), but you want to execute the request under the UNICOS account name dept_b, enter the following command:

```
% qsub -A dept_b sleeper
nqs-181 qsub: INFO
  Request <402.coal>: Submitted to queue <express> by <pat(456)>.
%
```

The account name is a valid UNICOS account name for the user on the host on which the request will run. The project name is a valid IRIX project name for the user on the host on which the request will run.

Alternatively, to run a request under a specific UNICOS account name or IRIX project name, you can set the NQS_ACCOUNTNAME environment variable to the required account name or project name before job submission. If you later specify the -A option, it overrides the setting of the environment variable.

If an alternative account name or project name is not specified, and the request executes at the local host, the request uses your account name or project name at the time of submission. If an alternative account name or project name is not specified, and the request executes at a remote host, the request uses your default account name or project name at the remote host.

On UNICOS systems, to find your current, default, and valid account names, use the `newacct`(1) command. For more information, see the `newacct`(1) man page.

On IRIX systems, to find your default and valid project names, view the `/etc/project` file; the first project name on the list is your default project name.

5.8 Using Alternative User Names

Unless you indicate otherwise, the batch request executes under the user name used when you submitted the request. You can specify that a request will run under another user name in the following ways:

- Use the NQE GUI `Submit` window and select `General Options` on the `Configure` menu. For the NQE database `User Name` option, enter the user name that you want to use, and apply your entry (click on the `Apply` button). To make your change part of the request's permanent configuration, use the `Save Current Job Profile` option.
- Use the `cqsub -u` *username* command or the `qsub -u` *username* command. You can use only the `cqsub -u` *username* command to submit a request to the NQE database.

The following example enables you, currently logged in as user `pat`, to execute the request under user name `bill`. You issue the following command:

```
cqsub -u bill job1
```

The following example enables `jack`, who is currently logged in, to become `jjackson` (the owner of the request) and to submit request `job1` to the NQE database as `Chemdept` (no spaces are allowed between the comma and the name of the owner of the request):

```
cqsub -u dbuser=Chemdept,jjackson job1
```

For a complete description of the `-u` option syntax, see the `cqsub`(1) or `qsub`(1) man page.

Note: When you specify an alternative user name, you must ensure that you have authorization to use the specified user name. For more information, see Chapter 2, page 21.

5.9 Using Request Priority

Two priority types affect a queued NQS request:

- A *preexecution priority*, which determines the order in which requests are chosen to begin execution by NQS.
- An *execution priority*, which determines how much priority is given to a particular executing request in relation to all other work on the server; for an executing request, the priority value is its nice value.

5.9.1 Preexecution Priority

The preexecution priority of a request is set by two priority values:

- The *interqueue priority* assigned to each NQS queue. This priority determines the order in which NQS scans the queues for work to be done.

  Note: The NQE administrator defines the interqueue priority, and an end user cannot change it.

  To view the interqueue priority of a queue, use the `cqstatl -d nqs -f` *queue* command or the `qstat -f` *queue* command (for details, see Section 11.2, page 159). The interqueue priority is the value shown after the label `Priority:` in the top right of the display.

  The priority can be an integer in the range 0 to 63. The higher the number, the higher the priority assigned to the queue.

- The *intraqueue priority* assigned to each NQS request. After NQS examines a queue to see whether any work is waiting, the intraqueue priority is used to determine the order in which requests are selected for execution.

  If more than one request that has the same priority is present in a queue, the request that has been queued for the longest time takes precedence. The NQE administrator can assign a default intraqueue priority. NQS assigns a default intraqueue priority to requests when they are submitted.

  The `qsub -p` command specifies either the user-requested priority or, for UNICOS systems that are running the Unified Resource Manager (URM), the URM priority increment. The priority is an integer between 0 and 63. If you do not use this option, the default is 1.

  If you are running URM, the priority increment value is passed to URM during request registration. URM adds this value as an increment value to the priority that it calculates for the request.

To view the intraqueue priority of a queued request, use the `cqstatl -d nqs -f` *request* command or the `qstat -f` *queue* `command` (see Section 10.2.2, page 146). The intraqueue priority is the value shown after the label `Priority:` in the top right of the display.

The priority can be in the range from 1 to 999. The higher the number, the higher the priority assigned to a request.

You can change the intraqueue priority in the following ways:

- Use the NQE GUI `Submit` window and select `General Options` on the `Configure` menu. Enter the priority number for the `Priority` option, and apply your entry (click on the `Apply` button). To save your changes, use the `Save Current Job Profile` option.
- Use the `cqsub -p` *priority* command or the `qsub -p` *priority* command. The `qsub -p` command specifies either the user-requested priority or, for UNICOS systems that are running the Unified Resource Manager (URM), the URM priority increment.

The interqueue and intraqueue priorities do not always determine the order in which requests are selected for execution. If execution of a request would cause some limit to be exceeded (for details, see Section 5.1, page 86, and Section 4.10, page 67), NQS can make exceptions to the order.

If NQS is configured to use URM scheduling (see the `qmgr set job scheduling` command), URM decides which requests are executed and in what order they will be executed. If the UNICOS fair-share scheduler is also running, NQS may use share priorities and weighting factors to compute the intraqueue priority for a request. The NQS administrator assigns the weighting factors, based on requested CPU time, requested memory, the length of time a job has been waiting in the queue, the fair share value, the requested MPP application CPU time, the number of requested MPP application PEs, and the user-specified priority.

The interqueue and intraqueue priorities affect only how NQS selects a request to begin execution. After a request has begun execution, these priorities have no influence.

5.9.2 Execution Priorities

For an executing request, the priority value is its nice value. A nice value exists for every executing process. The NQE administrator defines a default nice value increment for each batch queue. This value is assigned to a request when it is placed in the batch queue.

The nice value assigned to a request is the sum of the default system nice value, the request's nice increment, and the request owner's nice increment on the machine of execution.

You can override this default value in the following ways:

- Use the NQE GUI `Submit` window and select `Job limits` on the `Configure` menu. Enter the nice value for the `Nice Increment` option, and apply your entry (click on the `Apply` button). To save your changes, use the `Save Current Job Profile` option.
- Use the `cqsub -ln` command or the `qsub -ln` command.

To view nice values for requests, see Section 5.1.4, page 89.

Note: If you decrease the nice value, you increase the relative execution priority of a process. If you increase the nice value, you decrease the relative priority of the request.

You can specify nice increments that are outside the limits for the executing host. In such cases, NQS limits the specified nice increment to a value within the necessary range. Any nice increment that you specify must be acceptable to the batch queue in which the request is placed.

5.10 Submitting Requests to the IRIX Miser Scheduler

The IRIX 6.5 release introduces a new scheduler called the Miser scheduler. The Miser scheduler (also referred to as Miser) is a predictive scheduler. As a predictive scheduler, Miser evaluates the number of CPUs and amount of memory a batch job will require. Using this information, Miser consults a schedule that it maintains concerning the utilization of CPU and memory resources on the system. Miser will determine when the batch job can be started so that it meets its requirements for CPUs and memory. The batch job will be scheduled to begin execution based on that time.

Miser reserves the resources that a batch job requests. As a result, when the batch job begins to execute, it will not need to compete with other processes for CPU and memory resources. However, Miser may require that a job wait until its reservation period begins before it begins execution. There are some exceptions to this process. Batch jobs must provide the Miser scheduler with a list of resources that they will require. Currently, those resources are the number of CPUs, the amount of memory, and the length of time required.

For a request to be successfully submitted to the Miser scheduler on an NQE execution host, the following criteria must be met:

- The job scheduling class must be `miser normal` (for more information, see *NQE Administration*, publication SG–2150).
- The request must specify a Miser resource reservation option (for more information, see Section 5.10.1, page 103).
- The destination batch queue must forward requests to the Miser scheduler (for more information, see *NQE Administration*, publication SG–2150).
- Miser must be running on the execution host.
- The Miser queue exists and is accessible on the execution host.
- The request can be scheduled to begin execution before the scheduling window expires. The schedule for a request depends on the resources requests (CPU, memory, and time) (for more information, see *NQE Administration*, publication SG–2150).

5.10.1 Miser Resource Reservation Options for the qsub and cqsub Commands

The syntax for the Miser resource reservation option for the `qsub -X` and `cqsub -X` commands is:

```
qsub -X miser,seg,c=INT,m=INT[k|m|g][b],t=[H:M.S|INT[s|m|h]]
[,static][,mult=INT][,exc=kill][,seg,c=INT,m=INT[k|m|g][b],
t=[H:M.S|INT[s|m|h]][,static][,mult=INT][,exc=kill][...]
```

Currently, the Miser scheduler allows the specification of only one resource segment request. The options for the Miser scheduler are as follows:

`miser`	Specifies the local scheduler extension options for the Miser scheduler; this is required.
`seg`	Specifies that a new Miser resource segment is being described; this is required.
`c=`*INT*	Specifies the number of CPUs required for the segment being described; this is required.
`m=`*INT*	Specifies the amount of memory, in bytes, to reserve for the segment being described; this is required. Optionally, you can specify the byte units as either `k` (or `kb`), `m`, or `g` for kilobytes, megabytes, or gigabytes, respectively.

`t=[`*H*`:`*M*`.`*S*`|`*INT*`[s|m|h]`	The amount of CPU wall-clock time for the segment being described. The time can be specified in *hours:minutes.seconds* format or as an integer with a suffix. You can specify `s` for seconds, `m` for minutes, and `h` for hours. The CPU wall-clock time is the actual wall-clock time multiplied by the number of CPUs that have been requested. This option is required.
`static`	Indicates that the job cannot run opportunistically. If this option is not specified, the job may be able to execute before its scheduled period.
`mult=`*INT*	Specifies a multiple of CPUs that are allowed for job scheduling. If this option is not specified, `mult=1`.
`exc=kill`	Specifies the action to take when the specified time limit ends. Currently, the only action is to kill the job.

The syntax for the `cqsub` command is the same as the `cqsub` command except the destination for `cqsub` cannot be the NQE database. The destination must be the NQS system.

If the NQS execution host is not using `miser normal` scheduling, or the destination batch queue has not been specified to forward the request to the Miser scheduler, the request will be executed, but it will not obtain resources from the Miser scheduler.

5.10.2 Effect of Specifying Miser Resource Options on Request Limits

When you specify the Miser resource options, the request submission must indicate the number of CPUs, the amount of memory, and the length of time these resources will be required. A relationship between the Miser options for CPU count, amount of memory, and length of time has been defined for the per-request MPP PE count, the per-request memory limit, and the per-request time limit, respectively.

If the corresponding per-request limit for a request is less than the specified amount for the Miser resource option, the per-request limit is graduated to a value that agrees with the Miser resource specification. If the per-request limit for a request is greater than the amount specified for the Miser resource option, the per-request limit is not changed.

The per-request limits are changed before the job is submitted to the queuing system.

Working with Output Files [6]

This chapter describes how output files are returned to you and the options you have to control their location and content. The following topics are discussed:

- Naming output files (Section 6.1, page 107)
- Redirecting output (Section 6.2, page 109)
- Merging output files (Section 6.3, page 110)
- Finding lost output (Section 6.4, page 110)

For a summary of the `cqsub` or `qsub` command options that you can use to control output, see the `cqsub`(1) or `qsub`(1) man page.

For information about viewing output files as requests are executing and writing messages to output files, see Chapter 7, page 113.

6.1 Naming Output Files

After your batch request has completed execution, NQS returns the standard output, standard error, and job log files that the request produced. Your NQE administrator configures whether job log files are returned by default. If you do not receive a job log by default, you can specify that you want one by setting NQE GUI options or by using the appropriate `cqsub` or `qsub` command options.

The *standard output file* is referred to as `stdout`. This file contains output produced by your request and other system-generated information.

The *standard error file* is referred to as `stderr`. This file contains any error messages that the request generates.

The *job log file* contains a record of all of the events NQS processed for your request.

The output files are named as follows:

Standard output file: *name*`.o`*number*

Standard error file: *name*`.e`*number*

Job log file: *name*`.l`*number*

Note: NQS supports DFS path name formats for the standard output file, standard error file, and job log options so that job output can be returned to DFS.

The strings shown in italics can take the following values:

String	Value
name	The request name. If you submitted the request as standard input, the name is `STDIN`. If you submitted a script file, *name* is the first 7 characters of the file name. To change these defaults by using the NQE GUI, open the `Submit` window and select `Output Options` from the `Configure` menu. Enter the alternative *name* (use the full path name) after the appropriate output file option (`Alt STDOUT Path`, `Alt STDERR Path`, and/or `Alt JOBLOG Path`). To change these defaults by using the command line interface, use the `cqsub` command or the `qsub` command `-r`, `-o`, `-e`, and `-j` options. If you use the `-r` option, *name* is the first 7 characters of the string you specified. For more information on redirecting output, see Section 6.2, page 109.
number	The number that NQE assigns when the request is submitted. For a job going through the NQE database, the number is the task ID; for a job that is not going through the NQE database, the number is the request ID.

For example, you submitted a request that has the file name `mytestjob`, and you specified that you want to receive a job log. Successful submission and execution of the request would produce a standard output file that has the name `mytestj.o406`, a standard error file that has the name `mytestj.e406`, and a job log file that has the name `mytestj.l406`.

```
Request 406.coal submitted to queue: nqenlb.
% ls
mytestjob
mytestj.e406
mytestj.o406
mytestj.l406
```

If UNICOS MLS or UNICOS/mk security enhancements are enabled on the execution system, the output file returned to a remote host is created at the job execution label. You must specify a remote host directory that has either a wildcard label or a label that matches the job execution label, or that is a multilevel directory.

6.2 Redirecting Output

By default, your output files are returned to the directory from which you submitted the request. To specify another location and name for the files, use the `cqsub` or the `qsub` command options.

You can specify a location for `stdout`, `stderr`, and your job log file.

If you use the NQE GUI, to change these defaults, select `Submit->Configure->Output Options`. Enter the alternative *name* (use the full path name) after the appropriate output file option (`Alt STDOUT Path`, `Alt STDERR Path`, and/or `Alt JOBLOG Path`).

If you use the `cqsub` or the `qsub` command, the following commands or options place your files in the locations described:

Command or option	Location of output
`cqsub` or `qsub`	Directory from which you submitted the request. Its file name is `STDIN.o`*requestid_number.*
`-o` *filename*	Directory from which you submitted the request. Its file name is *filename*`.o`*requestid_number.*
`-o` *host:filename*	Specified server and file name. The directory is your home directory on *host*. The file name is *filename*.
`-o "%[`*user*`[/`*password*`]@]`*host*`[/`*domain*`]:`*pathname*`"`	Specified user, host, and path name. The *pathname* can be a simple file name or an absolute path. If the *pathname* is a simple file name, the file is placed in your home directory on the specified host. The *domain* specifies an FTA domain name that

uses network peer-to-peer authorization (NPPA) rather than a password. If you do not use NPPA, you can provide a *password*.

The following three DCE/DFS file name formats are supported:

`/:/`*your_file*

`/.:/fs/`*your_file*

`/.../`*your_cellname*`/fs/`*your_file*

6.3 Merging Output Files

You can merge the standard error file and the standard output file in the following ways:

- If you use the NQE GUI, select the `Merge STDOUT and STDERR` option in the `Output Options` window of the `Configure` menu and apply your change (click on the `Apply` button).
- If you use the `cqsub` or `qsub` command, the following options let you merge your output files into one file:

Option	Description
`-eo`	Appends `stderr` to `stdout`.
`-J m`	Appends the job log to `stdout`.

- To merge your output into a single file, use these options with either the `cqsub` or `qsub` command; for example:

  ```
  cqsub -eo -J m
  ```

6.4 Finding Lost Output

If your output is not in the directory you were in when you submitted the request or in a location you specified, you first should check electronic mail. If NQS has tried to write your output to a directory different from the one you specified, it sends you mail.

The mail message indicates where your output files were actually placed, as shown in the following example:

```
From root@cool Mon, 5 Jan 34:41 CST 1998
Date: Mon, 5 Jan 1998 12:34:41  -006
```

```
From: root@cool
Subject: NQS request: 2172.coal ended

Message concerning NQS request: 2172.coal ended.
Request name:   testjob
Request owner: jane
Mail sent at:   11:39:04 CDT
Request exited normally.

_Exit() value was: 0.

  Stdout file staging event status:
  Destination: -o coal:/home/usr/jane/testjob.o2172
    Output file could not be returned to primary destination.
    Output file successfully returned to backup destination
    in user home directory on the execution machine.

    Transaction failure reason at primary destination:
    No account authorization at transaction peer.

  Stderr file staging event status:
  Destination: -e coal:/home/usr/jane/testjob.e2172
    Output file could not be returned to primary destination.
    Output file successfully returned to backup destination
    in user home directory on the execution machine.

    Transaction failure reason at primary destination:
    No account authorization at transaction peer.
```

Usually, the reason your output files could not be written to your directory is because your home directory does not contain a suitable validation file entry authorizing NQS to write the output files. See Chapter 2, page 21.

If NQS cannot return the files to the requested directory and host, it tries to place it in the following directories:

- Your home directory on the NQS execution server. This is the server at which your request executed, not necessarily the one defined by `NQS_SERVER`. If this placement is successful, NQS sends you a mail message indicating that it used an alternate (secondary) output destination. The `From:` line of the mail message includes the name of the host that received the output file.

If you submitted the request by using a different user name, NQS tries to send the output to the home directory of that user name and sends the mail message to you.

- A special `failed` directory on the NQS execution server. If you receive a mail message telling you that this has occurred, contact your NQE administrator.

When using DCE/DFS, note the following:

- After a request completes, NQS uses `kdestroy` to destroy any credentials obtained by NQS on behalf of the request's owner.

Caution: On UNICOS systems, do not put a `kdestroy` within a request's job script; it will destroy the credentials obtained by NQS and prevent NQS from returning request output files into DFS space.

- On UNIX platforms, there is not an integrated login system feature available. NQS on UNIX platforms obtains separate DCE credentials for request output return. Therefore, a `kdestroy` placed within a request's job script running on an NQE UNIX server will not affect the return of request output files into DFS space.

Communicating with Requests [7]

You can communicate with your request as it executes. This chapter discusses the communication methods available to you. The following topics are covered:

- Monitoring the job log or event history (Section 7.1, page 113)
- Writing messages to output files (Section 7.2, page 114)
- Monitoring output during execution (Section 7.3, page 116)

7.1 Monitoring the Job Log or Event History

You can use one of the following methods to view the contents of a request's job log file or event history at any time that the job is running.

- If you use the NQE GUI, use the `Actions` menu of the NQE GUI `Status` window. To use the `Actions` menu, first position the pointer on the desired job line in the job summary area and highlight it by pressing the left mouse button, then select `Job Log` on the `Actions` menu.
- For an NQS request, use the `cqstatl` or `qstat` command; for example, you can use the following command on the server on which the request is executing (specified by `NQS_SERVER`):

  `cqstatl -d nqs -j` *requestid*

  The output is the job log file and it will look similar to the following example:

```
11/03 10:17:48 Arrived in <ice@latte> from <latte>.
11/03 10:17:53 Arrived in <batch@ice> from <latte>.
11/03 10:17:54 Arrived in <express@ice> from <batch@ice>.
11/03 10:17:56 Started, pid=<20624>, jid=<8215>, shell=<>, umask=<23>.
11/03 10:17:56 Running in queue <express>.
```

  If your request is running on a server other than the one specified by `NQS_SERVER`, you can change the value of your `NQS_SERVER` environment variable or you can use the `cqstatl -h` or `qstat -h` command to specify that host name, as in the following example:

  `cqstatl -d nqs -h ice -j` *requestid*

- For an NQE database request, use the following command (the `qstat` command cannot be used for an NQE database request):

  `cqstatl -d nqedb -j t`*id*

The output includes an event history of the NQE database tasks, as shown in the following example:

```
carob$ cqstatl -d nqedb -j t1
Event History for NQE Task:     t1

07/25/96 07:57:42 t1: NEW_STATE state=Pending  (ack=1)
07/25/96 07:57:53 t1: NEW_STATE state=Scheduled
owner=lws.carob  (ack=1)
07/25/96 07:58:01 t1: NEW_STATE state=Submitted  (ack=1)
07/25/96 07:58:01 t1: SUBMIT NQS Request ID 9.carob
(ack=1)
07/25/96 07:59:07 t1: NEW_STATE state=Completed
owner=scheduler.main  (ack=1)
07/25/96 07:59:08 t1: NQS exit.status=0  (ack=1)
07/25/96 07:59:13 t1: NEW_STATE state=Completed
owner=monitor.main  (ack=1)
```

You can write messages to the job log file as described in Section 7.2, page 114.

7.2 Writing Messages to Output Files

If an event has occurred, or will occur, that could affect your executing request, you can write a message to record that event to the output files produced by the request. To write this message, use the following command:

`qmsg`

Note: You must issue the `qmsg` command from the NQS server on which the request is running.

By default (or if you use the `qmsg -j` command), the `qmsg` command writes the message to the job log file of the request.

Note: You cannot write job log messages to requests in the NQE database; you can write job log messages only to requests running on NQS.

To send a message to the standard output file of a request, use the `qmsg -o` command. To send a message to the standard error file of a request, use the `qmsg -e` command.

If your NQE administrator configures the default return of the job log files as `off`, and your `qmsg` command provides no specific destination, the message is written to the standard error file.

After entering the `qmsg` command line, you can enter the lines that make up the message. To end each line, press `RETURN`. When you have typed in all of the lines of the message, press `CONTROL-d` to end the message.

The following example shows a message being written to the standard output file of a request:

```
% qmsg -o 407.coal
An important event occurred a few seconds ago.
George made the coffee.

CONTROL-d
```

If `qmsg` successfully writes the message to the request's output file, you do not receive a message.

You can send messages to the standard output and standard error files of only those requests that are executing under your own user name (unless you are defined as an NQS operator or manager). You also must be logged on to the NQS server on which your request is executing.

If you get the following message, it means that your request has not yet started to execute:

```
Request's stderr file does not exist
```

Wait a few seconds and try again.

If you get the following message, it means that the request completed execution or was sent to another system for execution:

```
Request 407.coal does not exist
```

Therefore, you cannot write to the request's output files.

7.3 Monitoring Output during Execution

By default, the standard output and standard error files generated by your request are not available to you until the request completes execution. You can use the NQE GUI or the command options described in this section to examine the standard output and standard error files as your request executes. If you cannot find your standard output and standard error files, see Section 16.11, page 230.

Through command options, NQS supports the writing of standard output and standard error files that a request produces to a directory on the server at which the request is executing. If the destination files are at an NQS server other than the execution server, these options are ignored.

You must submit your request to the server on which the output files will be written. If you do not know the server on which the output files will be written or do not specify the server, the options described in this section are ignored, and you cannot view your output during execution.

Note: If the UNICOS MLS feature or the UNICOS/mk security enhancements are enabled on your system, the job output files are labeled with the job execution label. For jobs that are submitted locally, the return of the job output files may fail if the job submission directory label does not match the job execution label. For example, if a job is submitted from a level 0 directory, and the job is executed at a requested level 2, the job output files cannot be written to the level 0 directory. If the home directory of the UNICOS user under whom the job ran is not a level 2 directory, does not have a wildcard label, or is not a multilevel directory, the job output files cannot be returned to that directory either. The job output files will be stored in the NQS failed directory.

If the UNICOS MLS feature or the UNICOS/mk security enhancements on are enabled on your system and you submitted a job remotely, the Internet Protocol Security Options (IPSO) type and label range that are defined in the network access list (NAL) entry for the remote host affect the job output file return.

You can indicate a specific execution server when submitting your request in the following ways:

- If you use the NQE GUI, open the `Config` window and change the `NQS Server` field of the `NQE User Preferences` menu (the `NQE User Preferences` menu is the default `Config` window).

- If you use the `cqsub` or `qsub` command, use the `-q` *queue* option; *queue* designates a batch or a pipe queue that has a destination batch queue on the execution server that will run your request.
- Set the `NQS_SERVER` environment variable to the execution server name.

The file name you specify for the output can include the name of an NQS server and a directory path. A simple file name indicates that the file will be written to the directory you were in when you submitted your request.

7.3.1 Using the NQE GUI

To examine the standard output and standard error files as your request executes, use the NQE GUI `Submit` window and select `Output Options` on the `Configure` menu. Ensure that the following options are selected, and apply your change (click on the `Apply` button) if you need to select any of them:

- `Write STDOUT during execution`
- `Write STDERR during execution`

To save your changes, use the `Save Current Job Profile` menu option on the `Configure` menu.

You also can merge `STDOUT` and `STDERR` by selecting the `Merge STDOUT and STDERR` option and applying your change (click on the `Apply` button). For additional information about working with output files, see Chapter 6, page 107.

7.3.2 Using the Command Line Interface

To examine the standard output and standard error files as your request executes, you must submit your request to your local server only. Use the following command when you submit the request:

`qsub -o` *ofile* `-ro -e` *efile* `-re`

The `-ro` and `-re` options specify that the standard output and standard error files will be written as they are produced (rather than after the request completes execution). NQS supports these options only for output files that are being written to the system at which the request is being executed.

If you use the `-ro` and `-re` options, the output is placed in the file (*ofile* or *efile*) as the request executes. The file name you specify for *ofile* and *efile* can include the name of an NQS host and a directory path. A simple file name indicates

that the file will be written to the UNICOS directory that was current when you submitted the request.

Path names specified by the `-o` and `-e` options that are not complete are interpreted on the originating machine. Ensure (by using the complete path name, if necessary) that the output file names are valid on the execution machine. This is true whether or not the `-ro` or `-re` options are used.

If the `-ro` and `-re` options are used, the output may not appear immediately in the output files due to `stdio` buffering (as much as 4Kb may be buffered). If the job output is small, it may not appear until the job completes.

For UNICOS systems, do not modify or remove the files until the request has completed execution; if a system shutdown occurs, they will be needed for request recovery.

To ensure that your request has completed execution, use the `cqstatl -a` command or the `qstat -a` command to display summary details of your requests; for example:

```
qstat -a
```

To display the request's job log file at any time, use the `cqstatl -j` command or the `qstat -j` command; for example:

`qstat -j` *requestid*

To merge the standard error file and the standard output file, use the `cqsub -eo` command or the `qsub -eo` command. For example, to combine the files and to write the output file to a specific file, you can use the following `qsub` options:

`qsub -ro -o` *ofile* `-eo`

7.3.3 Example of Monitoring Output

In the following example, `jane` submits the request `test` to the queue `gust`, which is a pipe queue that has a destination batch queue on the NQS server `gust`. She specifies that she wants the standard output and standard error files merged, and that the output file that has the name `TESTOUT` will be placed in the `tmp` directory.

If jane uses the NQE GUI, she would to the following:

1. To set her server to be her local server gust, jane would open the Config window and change the NQS Server field of the NQE User Preferences window to be gust, apply her change, and cancel the Config window. (The NQE User Preferences window is the default Config window.)
2. Open the NQE GUI Submit window.
3. Select General Options on the Configure menu, and do the following:
   - Enter test in the Request Name field.
   - Enter gust in the Queue Name field.
4. Apply the changes and cancel the General Options menu.
5. Select Output Options on the Configure menu, and select the following options:
   - Write STDOUT during execution
   - Merge STDOUT and STDERR
   - Keep STDOUT on execution host
6. Change the output directory path and name of the output file by entering /tmp/TESTOUT in the Alt STDOUT Path field.
7. Apply the changes and cancel the Output Options menu.
8. Submit her request test, as described in Chapter 4, page 49.
9. To save all of the changes made so she can use them in the future, jane would use the Save Current Job Profile option on the Configure menu.

If jane uses the cqsub or qsub command, she can do the following:

- Ensure that NQS_SERVER is set to gust.
- Enter the following command line, for example:

```
cqsub -eo -o gust:tmp/TESTOUT -ro -q gust test
```

After the request has been submitted, jane can log in to the server gust, change to the directory she specified, and view the file, as follows:

```
Request 4636.ice submitted to queue: gust.
snow% rlogin gust
Sun Microsystems Inc.   Solaris 2.5
gust% cd tmp
% tail TESTOUT
job start
/gust/u1/jane
Wed Feb 18 12:32:43 CST 1998
gust
gust%
```

Using Job Dependency [8]

NQE *job dependency* lets you specify an interdependency among events in shell scripts or NQS requests. For example, you can ensure that one request runs after another so that the second can use output from the first. This chapter discusses job dependency. The following topics are covered:

- Using job dependency (Section 8.1, page 121)
- Using `cevent` (Section 8.2, page 122)
- Job dependency example (Section 8.3, page 124)

8.1 Using Job Dependency

Job dependency lets a client script or NQS request post, read, and wait for events. Events are associated with the following information:

- Group. Each event is a member of a group. A group of requests or shell scripts can communicate by using events. The group is identified by a name that must be globally unique. Group names are limited to 1023 characters. They must begin with a letter and contain accepted C identifier characters.
- Name. Each event has a name that must be unique within its group. Names are limited to 1023 characters.
- Value. Optionally, events can have values. Client commands can set this value when posting an event and can obtain the value when reading an event. Values are limited to 4095 characters.
- Other information, such as the NQS originating user name, host, the time of events, and so on.

exit events are unique events for tracking NQS requests. NQS sends an event when a request completes and has the `NQE_GROUP` environment variable set. The event group name is obtained from `NQE_GROUP`. The event name has the form `EXIT_$QSUB_REQNAME`. The name is derived from the prefix `EXIT_` (that NQS automatically adds) and from the request's name as specified (if you are using the command line interface, the `cqsub -r` or `qsub -r` option is used to specify a request's name). This naming method lets the event be tested without using the request ID. The originator of the request owns its exit event.

The following criteria determine access to events:

- The user name that posts an event owns the event.
- Anyone who knows the group name can read an event.
- Only `root` can read or delete all events.

8.2 Using cevent

To specify events and their associated actions, use the `cevent`(1) command. The `cevent` command options let you post (`-p`), read (`-r`), clear (`-c`), and list (`-l`) events.

To post an event with the name `TAPE_HERE` under the group `mygroup`, use the following command:

```
cevent -p -g mygroup TAPE_HERE
```

You can then refer to the name `TAPE_HERE` when you read events.

The following `csh` command reads the event `TAPE_A` and stores it in a variable:

```
gottape='cevent -g mygroup -r TAPE_A'
```

The following `ksh` command reads the event `TAPE_A` and stores it in a variable:

```
set -A gottape $(cevent -g mygroup -r TAPE_A)
```

When you read events, you can specify a time interval to wait for the event to occur (the `-w` option) and the time interval between queries to the Network Load Balancer (NLB) database to see whether the event has occurred (the `-z` option). The NLB stores information about events and reports the information when it is queried.

The `cevent -l` option lists event values to standard output (`stdout`).

To list the events in a group named `mygroup`, use the following command:

```
% cevent -g mygroup -l

Time:                     Group:      Name:      Value:
-----------------------------------------------------------------
Mon Jan 26 10:14:14 1998  mygroup     n2         specified
Fri Jan 23 08:42:30 1998  mygroup     n1         <NONE>
```

The output tells you that you can read two events, one named `n2` and the other named `n1`. The event named `n1` was created without a value. The event named `n2` has a value. It was created by using the following command:

```
cevent -g mygroup -p n2=specified
```

The `cevent -d` option specifies a delimiter between the values. You can use delimiters to parse the output from `cevent` listings.

The default delimiter for `-r` commands is the : symbol. If you do not specify a delimiter, your output will look like the following:

```
% cevent -g mygroup -r n1 n2
<NONE>:specified
```

If you specified the # symbol as a delimiter, your command and output would look like the following:

```
% cevent -g mygroup -d '#' -r n1 n2
<NONE>#specified
```

You also can use the `-d` option to specify a delimiter between the events when you list them by using the `-l` option. The default delimiter is a space. The following example lists the events in the group `mygroup` and specifies that the delimiter is a # symbol:

```
% cevent -g mygroup -d '#' -l
Fri Jan 23 08:42:30 1998#mygroup#n1#<NONE>
Mon Jan 26 10:14:14 1998#mygroup#n2#specified
```

When you are finished using the events in a group, you can clear them from the database. To clear the events in a group named `mygroup`, use the following command:

```
cevent -c -g mygroup
```

For a summary of `cevent` options, see the `cevent`(1) man page.

8.3 Job Dependency Example

In the following example, the user wants to submit the request JOBB after the request JOBA successfully completes execution. The example uses ksh syntax.

```
#!/bin/ksh

#set NLB_SERVER (where data is stored) to host pendulum
export NLB_SERVER=pendulum

#set NQS_SERVER (where request is run) to host latte
export NQS_SERVER=latte

#set NQE_GROUP to A_THEN_B
export NQE_GROUP="A_THEN_B"

# Ensure that no events are outstanding
cevent -c
# Submit request JOBA
cqsub -r JOBA -q nqebatch <<EOF
ls -al
EOF

# Wait for completion of JOBA
done_A=‘cevent -r -w 10000 EXIT_JOBA‘
if (( $? != 0 )); then
echo "No exit event posted for JOBA"
exit 1
fi
echo "JOBA completed with exit status $done_A"

# Submit request JOBB and set its exit status to 23
cqsub -r JOBB -q nqebatch <<EOF
ls -al
exit 23
EOF

# Wait for completion of JOBB
done_B=‘cevent -r -w 10000 EXIT_JOBB‘
if (( $? != 0 )); then
echo "No exit event posted for JOBB"
exit 1
fi
echo "JOBB completed with exit status $done_B"
```

```
# List out events
echo "All events posted for group $NQE_GROUP:"
cevent -l

# Clear events
echo "Deleting events..."
cevent -c

exit 0
```

First the script sets up the user environment and clears all events that might be outstanding.

Next, `JOBA` is submitted. NQS exports the `NQE_GROUP` environment variable automatically, so you do not have to use the `cqsub -x` or `qsub -x` command.

The next `cevent` command waits for `JOBA` to complete. The event name `EXIT_JOB1` begins with the prefix `EXIT_`, which NQS automatically adds, followed by the name you gave the request. The `-w` option specifies that you want to wait no less than 10,000 seconds for the event to occur.

The next lines accommodate possible errors, such as a client command timing out. When the exit status of the request returns, it is recorded to `stdout`, and the script continues if the exit status is correct (that is, the exit status is `0`, indicating normal completion).

The final lines of the script submit the request `JOBB` and clear the events from this script.

The output from the script would be as follows:

```
Request 49.latte submitted to queue: nqebatch.
JOBA completed with exit status 0
Request 50.latte submitted to queue: nqebatch.
JOBB completed with exit status 23
All events posted for group A_THEN_B:
Time:                    Group:         Name:          Value:
-------------------------------------------------------------
Mon Mar 16 15:01:16 1998  A_THEN_B       EXIT_JOBB      23
Mon Mar 16 15:00:44 1998  A_THEN_B       EXIT_JOBA      0
Deleting events...
```

Customizing Your Environment [9]

This chapter describes how you can use environment variables and default files to customize your NQE environment. The following topics are discussed:

- Environment variables automatically set (Section 9.1, page 127)
- Customizing your NQE environment (Section 9.2, page 129)
- Configuring NQE `Load` window elements (Section 9.3, page 133)

9.1 Environment Variables Automatically Set

Your request begins execution with your login environment. A request is executed under your user name unless you specify another user name. (For information about using an alternative user name, see Section 5.8, page 99).

When a request begins execution, the following events occur:

- NQS determines the shell to use. By default, NQS uses your default login shell. To specify a shell, modify your request file as described in Section 5.3, page 94.
- The shell invoked by NQS executes login files. These files are the `.profile` (`sh` or `ksh` shell) or `.cshrc` and `.login` (`csh` or `tcsh` shell) files of the request owner's user name.
- NQS saves the `HOME`, `LOGNAME`, `MAIL`, `PATH`, `SHELL`, `TZ`, and `USER` environment variables and renames them with the `QSUB_` prefix, as shown in Table 3.
- NQS also sets the environment variables shown in Table 4.
- If you send your request to the NQE database, the LWS sets the environment variables shown in Table 5.

Table 3. Environment Variables Set by NQS

Name	NQS name	Description
HOME	QSUB_HOME	Path name of the home directory for the user who submitted the request
LOGNAME	QSUB_LOGNAME	Login ID (user name) of the user who submitted the request
MAIL	QSUB_MAIL	Path name of the mail box for the user who submitted the request
PATH	QSUB_PATH	Search path for commands for the user who submitted the request
SHELL	QSUB_SHELL	
TZ	QSUB_TZ	Time zone for the user who submitted the request
USER	QSUB_USER	User name of the user who submitted the request

Table 4. Additional Environment Variables Set by NQS

Name	Description
NQE_SHEPHERD_PID	Shepherd process ID (PID) of the job
QSUB_HOST	Host name of the NQS server
QSUB_REQID	Request identifier for the request
QSUB_REQNAME	Name of the request
QSUB_WORKDIR	Current directory when the request was submitted
QSUB_NQC	Host name of the NQE client

Name	Description
TMPDIR	Request's temporary directory, created by NQS, as described in Section 4.16, page 82.
ENVIRONMENT	NQS sets the ENVIRONMENT environment variable to a value of BATCH. You can use this variable, for example, in .profile, .login, or .cshrc files to differentiate between interactive and batch sessions. This environment variable can be used to avoid performing terminal setup operations for a batch request. A benefit of NQS initiating the batch request as a login shell is that .profile, .login, or .cshrc scripts are run, and your environment is set up as expected.

Table 5. Environment Variables Set by the LWS

Name	Description
NQEDB_CLIENTHOST	Host from which the request was submitted
NQEDB_ID	Database name and the task ID (for example, nqedb.t123)
NQEDB_USER	NQE database user name that owns the task (usually $LOGNAME)

9.2 Customizing Your NQE Environment

In addition to setting the environment variables that you must set to use NQE (see Section 2.2, page 22), you can also set the environment variables described in this section.

Note: Setting any of the environment variables listed in Table 6, page 130 overrides your NQE system's default setting, which is the value in the NQE system configuration file.

If you use the NQE GUI, you can set the equivalent of the following environment variables by selecting specific menu options. You can use the Config display to set (configure) the interface to your individual preferences. You can then specify a profile for use with a specific request during the submit

or job-launching process. You can also use the `Config` display to view how your variables are currently set.

You can specify that all environment variables that you have set whose names do not conflict with the automatically exported variables also be exported. If you use the NQE GUI, select `Submit->Configure->General Options->Export ENV Variables`. If you use the `cqsub` command or the `qsub` command, use the `-x` option.

Table 6. NQE Environment Variables You Can Set

Name	Description
`QSUB_QUEUE`	Names a specific queue to be used, as described in Section 4.9, page 65.
`NQSATTR`	Lists attributes associated with the request, as described in Section 4.6, page 60.
`NQSCHGINVOKE`	Specifies that NQS invoke one shell instead of two shells, as described in Section 5.3, page 94.
`NQEINFOFILE`	Specifies the path name of the NQE configuration file, which is the `nqeinfo` file. If this is set, the values for all environment variables that are set within the `nqeinfo` file will be used. If you use the command line interface, this environment variable is effective only when using the client commands (`cevent`, `cload`, `cqdel`, `cqstatl`, and `cqsub`). For more information on the `nqeinfo` variables, see the `nqeinfo`(5) man page.

Name	Description
NQE_GROUP	Specifies a name associated with one or more job dependency events, as described in Section 8.1, page 121. If you do not set this variable, you must specify a group name on each `cevent` command line. NQS automatically exports the value of the environment variable if you have set it, so you do not have to export all environment variables each time you submit the request. For information about using job dependency, see Chapter 8, page 121. If you use the command line interface, this environment variable is effective only when using the client commands (`cevent`, `cload`, `cqdel`, `cqstatl`, and `cqsub`).
NQE_DEST_TYPE	Designates the destination of your request (either `nqs` or `nqedb`), as described in Section 4.3.2, page 57, and the `cqsub`(1) man page. If you use the command line interface, this environment variable is effective only when using the client commands (`cevent`, `cload`, `cqdel`, `cqstatl`, and `cqsub`).
NQEDB_USER	Designates the NQE database user name for a request being submitted to the NQE database, as described in Section 4.3.1, page 56, and the `cqsub`(1) man page. If you use the command line interface, this environment variable is effective only when using the client commands (`cevent`, `cload`, `cqdel`, `cqstatl`, and `cqsub`).

Name	Description
NQS_PASSWORD_NEEDED	Prompts for a password when you submit requests, request status, delete requests, or send signals to requests from the client; for information about how to set this environment variable, see Section 5.6, page 97. If you use the command line interface, this environment variable is effective only when using the client commands (`cevent`, `cload`, `cqdel`, `cqstatl`, and `cqsub`).
NQS_SERVER	Directs your request to run on a specified server or to communicate with the specified server. If you use the command line interface, this environment variable is effective only when using the client commands (`cevent`, `cload`, `cqdel`, `cqstatl`, and `cqsub`).
NLB_SERVER	Designates a specified host in your network on which the NLB software is located. This environment variable is used for system load displays. If you use the command line interface, this environment variable is effective only when using the client commands (`cevent`, `cload`, `cqdel`, `cqstatl`, and `cqsub`).

You can set the `ilb` environment variables, as described in Table 7; for information about executing a load-balanced interactive command, see the `ilb`(1) man page:

Table 7. `ilb` Environment Variables

Name	Description
`ILB_USER`	Defines the login name to use on the remote system. This variable also alters the value of `$USER` in the `ilbrc` files. The default value is whatever `$LOGNAME` is set to be in your environment.
`ILB_PROMPT`	A regular expression that identifies your prompt on a remote machine. The default value is `"^.*\[%$#:\] $"`, which looks for any string ending with `%`, `$`, #, or `:`.

Note: The `NLB_SERVER` environment variable can also be used when using the `ilb` environment variables; `NLB_SERVER` defines the machine name and port number of the NLB server.

9.3 Configuring NQE Load Window Elements

You can configure elements in the NQE GUI `Load` window. To configure elements, edit the `.Xdefaults` files or use the `nqe`(1) command. For information about the `nqe` command options, see the `nqe`(1) man page.

Some of the items you can configure are as follows:

- Creation, modification, configuration, and removal of charts
- Colors used in the displays for such things as menu bars and for indicating different queues, requests, or old data
- How often the data in the displays is updated
- The interval during which data can remain in a display without being updated before it is marked as old
- The chart formulae that are used in the `Load` displays
- The number and names of the charts in the `Load` displays
- Which mouse buttons cause which actions to occur
- The height, width, and location of the initial displays

Alternatively, you can include your preferences in your `$HOME/.Xdefaults` file.

If you edit `$HOME/.Xdefaults`, the lines that customize your display are prefixed by the command name, as follows:

```
nqe*critcolor: red
```

This line makes red the default color to use when a bar is displayed with a value that is over the critical threshold.

If you create separate files, you can eliminate the name of the command.

Note: You can vary fonts in the displays, but only titles on the displays change. The fixed portions of the display will not change. For more information, see the `nqe`(1) man page.

The following is an example of an `.Xdefaults` file:

```
*server:                poplar
*ident:                 NLB
*age:                   90
*refresh:               3
*chartnames:            memdem syscpu idlecpu totio
*attributes:    {{NLB_HARDWARE ""} {NLB_OSNAME ""} {NLB_RELEASE ""}\
        {NLB_NCPUS ""} {NLB_PHYSMEM Kbytes} {NLB_FREEMEM Kbytes}\
        {NLB_SYSCPU %} {NLB_IDLECPU %} {NLB_NUMPROC ""}\
        {NLB_PSWCH /sec} {NLB_IOTOTAL Kbytes/sec}\
        {NLB_SWAPPING Kbytes/sec} {NLB_TMPNAME ""}\
        {NLB_FREETMP Mbytes} {NLB_SWAPSIZE Mbytes}\
        {NLB_SWAPFREE Mbytes}}
*regcolor:      green
*critcolor:     red
*memdem.title: Memory Usage
*memdem.expr:   100.0 * (NLB_PHYSMEM - NLB_FREEMEM + \
                        1024.0 * (NLB_SWAPSIZE - NLB_SWAPFREE)) / NLB_PHYSMEM
*memdem.min:    0
*memdem.max:    200
*memdem.log:    false
*memdem.abrv:   mem
*memdem.critical: 150
*memdem.suffix: %

*syscpu.min:    0
*syscpu.max:    50
```

```
*syscpu.log:    false
*syscpu.abrv:   sys
*syscpu.critical: 25
*syscpu.suffix: %

*idlecpu.min:   0
*idlecpu.max:   50
*idlecpu.log:   false
*idlecpu.abrv: idl
*idlecpu.critical: 25
*idlecpu.suffix:        %
*idlecpu.critcolor:     green
*idlecpu.regcolor:      red

*totio.min:     0
*totio.max:     50
*totio.log:     false
*totio.abrv:    i/o
*totio.critical: 25
*totio.suffix: %
*totio.critcolor:       violet

*command1: popup_hostinfo $thishost
*command2: exec xterm -title $thishost -n $thishost -e rsh $thishost &"
*command3: popup_minichart $thishost
```

Monitoring Requests [10]

This chapter describes how to use the NQE GUI `Status` window and the `cqstatl` command or `qstat` command to display information about requests. The following topics are covered:

- Using the NQE GUI `Status` window (Section 10.1, page 137)
- Using the `cqstatl` command or the `qstat` command (Section 10.2, page 141)
  - Displaying summaries (Section 10.2.1, page 142)
  - Displaying details (Section 10.2.2, page 146)
  - Displaying requests on other servers (Section 10.2.3, page 149)
  - Specifying another user name (Section 10.2.4, page 150)
  - Displaying Cray MPP information (Section 10.2.5, page 151)
- Request status codes (Section 10.3, page 151)

Note: If you do not have an NQE license, you cannot access the NQE GUI and the `cqstatl` command. You can access only the `qstat` command from an NQS server.

If the UNICOS multilevel security (MLS) feature or the UNICOS/mk security enhancements are enabled on your system and NQS is configured to enforce mandatory access control (MAC), your active label must dominate the job submission label in order for you to receive status information. To display the job submission and execution label information for a specific job, use the `qstat -f` command. NQS managers and operators bypass the MAC checks.

10.1 Using the NQE GUI `Status` Window

The NQE GUI `Status` window provides a refreshed summary of request status. By default, you can see all of the requests in the group of execution nodes in the NQE cluster; your NQE administrator cannot disable this display. However, your NQE administrator can enable or disable the display that provides the full details of the requests that you submit.

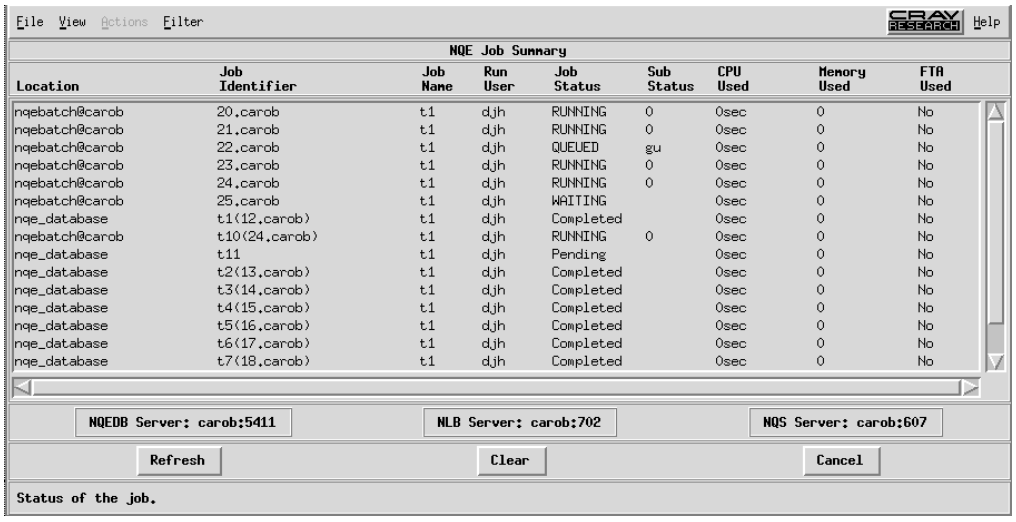
Using the NQE GUI `Status` window lets you do the following:

- Monitor status of all your requests. You do not have to know the location of your request before you request status on it. Request status is updated (refreshed) at configurable intervals.
- Tailor the display. You can specify how you want your display to look and what information is displayed.

To open NQE GUI `Status` window, access the NQE GUI by keying in the `nqe` command and, using the left mouse button, click once on the `Status` button of the initial NQE GUI button bar.

Note: The mouse button settings described in this guide are the default settings.

Figure 13 shows the `Status` window.



a10375

Figure 13. NQE GUI `Status` Window

The following data about requests is displayed by default:

Column name	Description
`Location`	The request's location, which can be either a queue or the NQE database.

`Job Identifier`	The job identifier; possible identifiers are as follows: • NQS request ID (for example, `5703.fog`). • NQE database ID, known as the task ID or `t`*id* (for example, `t1`). • NQE database ID with the NQS request ID; the copy of the request that is executed receives an NQS request ID (for example, `t4(61178.rain)`).
`Job Name`	Name of the request
`Run User`	User name with which the request was submitted.
`Job Status`	Status of the request. For details of the abbreviations used, see Section 10.3.1, page 151.
`SubStatus`	Substatus of the request. For details of the abbreviations used, see Section 10.3.2, page 152. Some states do not have an associated substatus.
`CPU Used`	CPU usage (in seconds) for the request. On some platforms, a display of the amount of CPU that the request consumes is not available, and a 0 appears in this column.
`Memory Used`	Memory usage (in words) for the request. On some platforms, a display of the amount of memory that the request consumes is not available, and a 0 appears in this column.
`FTA Used`	FTA usage for the request; usage setting can be `Yes` or `No`.

You can get the following online help by using the NQE GUI `Status` window:

- The context-sensitive help area is located in the lower left area at the bottom of the `Status` window. This area shows one-line informational messages about the area on the `Status` window that is directly under your mouse pointer.
- `Help` menu button. The `Help` menu button is located in the upper right of the window. It lets you open a window that displays help topics that you can select and view. Use the left mouse button to select a topic.

From the main `Status` window, you can select specific requests and receive a detailed display. To view a detailed display, do one of the following:

- Double-click on a request in the main window.
- Click once on the request in the main window, pull down the `Actions` menu, and select `Detailed Status`.

This action can take a long time to complete, depending on network traffic.

Note: If you cannot perform this operation, you cannot perform the same operation by using the `cqstatl -f` command or the `qstat -f` command. Your privileges may not be set correctly.

The `Filter` menu lets you control the number of requests displayed. Table 8, page 140 explains how you can use these filters. Figure 14 shows a sample `Originating Host` submenu.

Note: To select an item, click on the box next to it, and then click the `Apply` button. The `Set All` button selects all available options in the display. The `Unset All` button eliminates all selected items. If you click on the `Unset All` button, you can select other items you want to appear.

Table 8. NQE GUI `Status` Window Filter Options

Filter	Description
`Destination Host`	Displays only specified destination hosts, including the NQE database
`Run User`	Displays only requests currently owned by the specified user name
`Originating User`	Displays only requests originally submitted by the specified user name
`Originating Host`	Displays only requests submitted from the specified host, including the NQE database
`Location`	Displays only requests that are at the specified location
`Job Identifier`	Displays only requests that have the specified NQS request identifier or NQE database task identifier
`Clear Filters`	Resets all filters to a cleared state

Filter	Description
`List Filters`	Lists a summary of all filters in use
`Save Filters`	Saves all filters in use

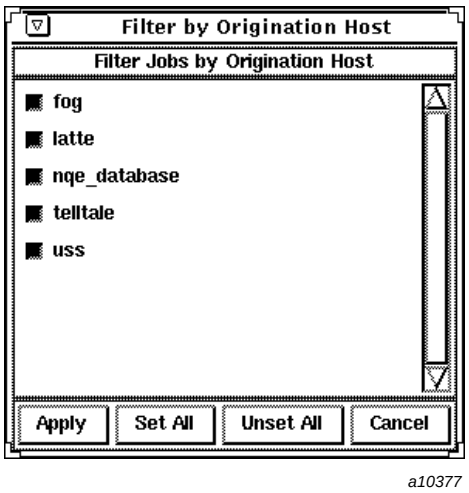


Figure 14. Sample `Originating Host` Filter Submenu

10.2 Using the `cqstatl` and `qstat` Commands

The `cqstatl` command and the `qstat` command provide request status information in an ASCII-based, static display.

For a summary of the `cqstatl` and `qstat` command options, see the `cqstatl`(1) and `qstat`(1) man pages.

This section covers the following topics:

- Displaying summaries (Section 10.2.1, page 142)
- Displaying details (Section 10.2.2, page 146)
- Displaying requests on other servers (Section 10.2.3, page 149)
- Specifying another user name (Section 10.2.4, page 150)
- Displaying Cray MPP information (Section 10.2.5, page 151)

10.2.1 Displaying Summaries

You can display a summary of requests that are in batch queues, pipe queues, and the NQE database (requests in pipe queues are not applicable for requests sent to the NQE database).

10.2.1.1 Summary of Particular Requests

To display summary information for particular requests sent to the NQE database, use the following command (the `qstat` command cannot be used for requests sent to the NQE database):

```
cqstatl -d nqedb tids
```

The `t`*ids* argument is the task identifier displayed when you submitted the request to the NQE database. You can specify more than one task identifier. Separate request identifiers with a space. (The `t`*id* is also displayed on the NQE GUI `Status` window.)

To display summary information for particular NQS requests, you can use the following commands:

```
cqstatl -d nqs requestids
```

```
qstat requestids
```

The *requestids* argument is one of the following:

- If you submitted a request to NQS, *requestid* is the request identifier displayed when you submitted the request to NQS.
- If you submitted a request to the NQE database, *requestid* is the request identifier of the copy of the request executing in NQS. The *requestid* is displayed on the NQE GUI `Status` window in parentheses after the `t`*id* (for example, `t4(61178.rain)`).

You can specify more than one request. Separate request identifiers with a space.

10.2.1.2 Summary of All Your Requests

To display summary details of all your requests in the NQE database, use the following command (the `qstat` command cannot be used for requests sent to the NQE database):

```
cqstatl -d nqedb -a
```

Note: If you have the NQE_DEST_TYPE environment variable set to be nqedb, omit the -d nqedb option.

The following display shows a summary of all requests that belong to the user who issued the cqstatl -d nqedb -a command.

```
carob$
carob$ cqstatl -d nqedb -a
--------------------------------
NQE Database Request Summary
--------------------------------
IDENTIFIER  NAME   SYSTEM-OWNER    USER     LOCATION/QUEUE ST
---------- ------- --------------- -------- -------------- ---
t1         STDIN   monitor.main    shelley  NQE Database   NComp
t3         STDIN   monitor.main    shelley  NQE Database   NTerm
t4         STDIN   monitor.main    shelley  NQE Database   NTerm
t5         STDIN   scheduler.main  shelley  NQE Database   NPend
```

Note: By default , if you use the cqstatl command without options or arguments, the output is a summary of each NQS queue on the NQS server. However, if you have the NQE_DEST_TYPE environment variable set to be nqedb, and you use the cqstatl command without options or arguments, the output is a summary of all your requests in the NQE database minus all terminated requests. (For additional information about monitoring queues, see Chapter 11, page 155.)

The columns in the request summary displays have the following meanings:

Column name	Description
IDENTIFIER	The task identifier, as displayed when you first submitted the request. The t*id* is also displayed on the NQE GUI Status window.
NAME	The name of the request. If you omitted this option when submitting the request, NAME is the name of the script file, or STDIN if the request was created from standard input.
SYSTEM-OWNER	The NQE database component currently owning the request.

USER	The name under which the request will be executed at the NQS system (either the name of the user who submitted the request or the name of the user specified when the request was submitted).
LOCATION/QUEUE	The request resides in the NQE database.
ST	An indication of the current state of the request. This can be composed of a state value and a substate value (similar to major and minor status values for requests sent to NQS). For a description of state codes, see Section 10.3.1, page 151. For a description of substate codes, see Section 10.3.2, page 152.

You cannot use the `cqstatl` or `qstat` command to display details about the requests of other users unless you are an NQE administrator. For more information, see Section 10.2.4, page 150.

To display summary details of all your requests on your NQS server (as defined by `NQS_SERVER`), use the following command, for example:

```
cqstatl -a
```

Note: If you have the `NQE_DEST_TYPE` environment variable set to be `nqedb`, the preceding command displays the output shown in Section 10.2.1.2, page 142.

The following is a summary of all NQS requests that belong to the user who issued the `cqstatl -a` command:

```
% cqstatl -a
------------------------------
NQS BATCH REQUEST SUMMARY
------------------------------
IDENTIFIER   NAME    USER     LOCATION/QUEUE        JID  PRTY REQMEM REQTIM ST
------------ ------- -------- -------------------- ---- ---- ------ ------ ---
1108.coal    testjob us1      small@green1         3494  --- 262144    600 R
------------------------------
NQS PIPE REQUEST SUMMARY
------------------------------
IDENTIFIER    NAME    OWNER    USER     LOCATION/QUEUE         PRTY ST
------------- ------- -------- -------- -------------------- ---- ---
1049.coal     test2   1201     us1      gust@coal               1 R
```

The columns in the request summary displays have the following meanings:

Column name	Description
IDENTIFIER	The request identifier (as displayed when you first submitted the request). The request identifier is also displayed on the NQE GUI `Status` window.
NAME	The name of the request. If you omitted this option when submitting the request, `NAME` is the name of the script file, or `STDIN` if the request was created from standard input.
OWNER	(Pipe queue displays only) The user ID under which you were logged in when you submitted the request.
USER	The user name under which the request will be executed at the NQS system.
LOCATION/QUEUE	The NQS queue in which the request currently resides.
JID	(Batch queue displays only) NQS job identifier.
PRTY	For a request awaiting execution, its intraqueue priority; for an executing request, its nice value. The priority value is not available until after the NQS scheduler examines the queue (the priority field displays only dashes (`---`) while the queue is examined). After the scheduler examines the queue, the requests are sorted in order of priority. For an executing request, the priority is its nice value; for a queued request, the priority is its intraqueue priority, which is a value from 1 through 999. For an executing request that is scheduled by using the `qmgr schedule request first` or `qmgr schedule request next` command, the priority is displayed as `FRST` or `NEXT`, respectively. For an executing request that is scheduled by using the `qmgr schedule request now` command, the priority is displayed as `NOW`.
REQMEM	(Batch queue displays only) The maximum amount of memory (in Kilowords) that the request is allowed to use if the request has not

	started to execute. If the request is executing, `REQMEM` shows the current amount of memory allocated to the request.
`REQTIM`	(Batch queue displays only) The number of seconds of CPU time remaining for the request. You can monitor this column to determine how your request is progressing.
`ST`	An indication of the current state of the request. This can be composed of a major and a minor status value. For a description of major status codes, see Section 10.3.1, page 151. For a description of minor status codes, see Section 10.3.2, page 152.

You cannot use the `cqstatl` command or the `qstat` command to display details about the requests and NQS activity of other users unless you are an NQE administrator or unless you are authorized to execute NQS requests under another user name. For more information, see Section 10.2.4, page 150.

10.2.2 Displaying Details

To display the full details of all your requests, use one of the following commands.

- If you submitted a request to NQS, you can use one of the following commands:

  ```
  cqstatl -d nqs -f requestids
  ```

  ```
  qstat -f requestids
  ```

  The *requestids* argument is the request identifier displayed when you submitted the request to NQS. You can specify more than one request. Separate request identifiers with a space.

- If you submitted a request to the NQE database, use the following command:

  ```
  cqstatl -d nqedb -f tids
  ```

  Note: If you have the `NQE_DEST_TYPE` environment variable set to be `nqedb`, omit the `-d nqedb` option.

For requests sent to the NQE database, the t*ids* argument is the task identifier of the request in the NQE database. You can specify more than one task. Separate task identifiers with a space. When the request is in NQS, it receives a *requestid*, which is displayed on the NQE GUI `Status` window in parentheses after the t*id* (for example, `t4(61178.rain)`).

The following sample display shows the output if you specified request `155` in an NQS batch queue. Some of the resource limits shown in the display are enclosed in the < and > symbols, which indicate that you did not explicitly specify the limit. Instead, NQS has taken the limit from either the resource limits associated with the queue or the user database (UDB) limits associated with the user under whom the request is executing (whichever limit is most restrictive).

Per-process and per-request limits are associated with each request. These are shown in the `PROCESS LIMIT` and `REQUEST LIMIT` columns in the display. For a discussion of per-process and per-request limits, see Section 5.1.3, page 89.

Note: If a request that was sent to the NQE database is executing, `cqstatl` obtains status from NQS. If the request that was sent to the NQE database is not executing, status information is obtained from the NQE database. The detailed display of an NQE database request will be similar to the following sample display; it also will include the request's NQE task identifier (t*id*).

For more information on the display fields, see the `cqstatl`(1) or the `qstat`(1) man page.

```
% cqstatl -d nqs -f 155 | more
---------------------------------
NQS BATCH REQUEST: job.latte           Status:          RUNNING
---------------------------------                              Processes
                                                               Active
        NQE Task ID: - -
        NQS Identifier: 155.latte              Target User:    jane
                                               Group:          pubs
        Account/Project: <[1201]>
        Priority:       ---
        User Priority/URM Priority Increment: 1
        Job Identifier: 16802
        Local Scheduler: Requested = OS default, Using = OS default

        Created:        Wed Mar 18 1998        Queued:         Wed Mar 18 1998
                        12:34:04 CST                           12:34:08 CST
<LOCATION/QUEUE>
        Name:           nqebatch@latte          Priority:       30
<RESOURCES>
```

```
                              PROCESS LIMIT   REQUEST LIMIT
        CPU Time Limit         <unlimited>     <unlimited>
        Memory Size               <256mw>         <256mw>
        Permanent File Space      <100mb>           <0>
        Quick File Space            <0>             <0>
        Type a Tape Drives                          <0>
        Type b Tape Drives                          <0>
        Type c Tape Drives                          <0>
        Type d Tape Drives                          <0>
        Type e Tape Drives                          <0>
        Type f Tape Drives                          <0>
        Type g Tape Drives                          <0>
        Type h Tape Drives                          <0>
        Nice Increment              <0>
        Temporary File Space        <0>             <0>
        Core File Size            <256mw>
        Data Size                 <256mw>
        Stack Size                <256mw>
        Working Set Limit         <256mw>
        MPP Processor Elements                      <0>
        MPP Time Limit             <10sec>         <10sec>
        Shared Memory Limit                         <0>
        Shared Memory Segments                      <0>
        MPP Memory Size           <256mw>         <256mw>
<FILES>                 MODE           NAME
        Stdout:         spool          jane@latte:/home/ice34/jane/job.o155
        Stderr:         spool          jane@latte:/home/ice34/jane/job.e155
        Job log:        spool          jane@latte:/home/ice34/jane/job.l155
        Restart:                       <UNAVAILABLE>
<MAIL>
        Address:               jane@latte     When:
<PERIODIC CHECKPOINT>
        System:         off                    Request:        System Default
        Cpu time:       on     60 Min          Cpu time:       def <Default>
        Wall clock:     off   180 Min          Wall clock:     def <Default>
        Last checkpoint:None
<SECURITY>
        Submission level:              N/A
        Submission compartments:       N/A
        Execution level:               N/A
        Execution compartments:        N/A
<MISC>
        Rerunnable      yes                    User Mask:      027
```

```
Restartable     yes                    Exported Vars: basic
Shell:          DEFAULT
Orig. Owner:    1201@latte
```

10.2.3 Displaying Requests on Other Servers

Note: Requests submitted to the NQE database do not require the `cqstatl` command to view requests on other servers. The NQE GUI `Status` window displays all requests submitted to the NQE database that are routed to any location in the group of execution nodes in the NQE cluster.

If your requests are routed to queues at a remote NQS server, you can specify the name of the remote system in one of the following ways to display details about the requests:

- Use the `cqstatl -h` command or the `qstat -h` command and specify the network host name of the NQS server. For example, the following command displays a summary status of all your requests at an NQS host called `sun1`:

  ```
  cqstatl -a -h sun1
  ```

- Include the host name when you specify a specific request identifier to `cqstatl` or `qstat`, as follows:

  request_identifier@*target_host*

The `cqstatl` command in the following example displays summary information about a request called `1060.coal` at an NQS server called `green1`:

```
% cqstatl 1060.coal@green1
------------------------------
NQS BATCH REQUEST SUMMARY
------------------------------
IDENTIFIER    NAME     USER     QUEUE              JID  PRTY REQMEM REQTIM ST
------------ -------  -------- ------------------ ---- ---- ------ ------ ---
1060.coal     testjob  us1      small@green1       3494  --- 262144    600 R
```

If password validation is in force, you must include the `cqstatl -P` option or set the `NQS_PASSWORD_NEEDED` environment variable to ensure that you are prompted for a password. The password requested is for the user name at the remote NQS server on which the request executes.

If both password validation and validation files are in force at the remote system, omit the `-P` option on the `cqstatl` command line. The validation file is then checked.

If validation files are checked, the `cqstatl` command is successful only if your user name and a host are included in a validation file at the remote system. For more information about passwords and validation files, see Chapter 2, page 21.

If the UNICOS MLS feature or the UNICOS/mk security enhancements are enabled on a remote host, you cannot display information from that remote host if the host has a workstation access list (WAL) entry for the host of origin that restricts your access to NQS services.

10.2.4 Specifying Another User Name

To display information about requests submitted under another user name, use one of the following commands:

`cqstatl -u` *username*

`qstat -u` *username*

Note: For NQE database requests, you must use the following command: `cqstatl -d nqedb -u dbuser=`*dbusername*.

If password validation is in force, you must include the `cqstatl -P` option or set the `NQS_PASSWORD_NEEDED` environment variable to ensure that you are prompted for a password.

If both password and file validation are in force, you do not have to set the environment variable or specify the `cqstatl -P` option. The validation file for *username* is checked as described in Section 2.8, page 27.

The following example displays summary information about the requests submitted by user name `sandy` that are executing at remote server `sun1`:

```
cqstatl -a -h sun1 -u sandy
```

If the UNICOS MLS feature or the UNICOS/mk security enhancements are enabled on your system and you submit a remote request, the system might be configured to require the `/etc/hosts.equiv` and `.rhosts` files to each contain a match for the remote host and require that the remote user and local user names match (that is, the `-u` option is not allowed).

10.2.5 Displaying Cray MPP Information

To display information related to the Cray MPP systems, use the `cqstatl -m` command or the `qstat -m` command. For more information about this command option, see the `cqstatl`(1) or the `qstat`(1) man page.

10.3 Request Status

The request status is expressed in two parts: the major status and the minor status if the request was sent to NQS, or the state and substate if the request was sent to the NQE database. The status codes are described in the following sections.

10.3.1 Status Codes

The major status or state of a request can be one of the following codes:

Status/State	Description
A	ARRIVING. The request is arriving in a queue.
C	CHECKPOINTED. (UNICOS, UNICOS/mk, and IRIX systems only.) The request in a batch queue was checkpointed and is no longer running.
D	DEPARTING. The request left a pipe queue before its arrival at a destination queue.
E	EXITING. The request in a batch queue completed execution and is currently leaving the system.
H	HELD. The request was prevented from entering another state by operator action. If the request had already been running, a restart file was created.
N	NQE Database. The request is in the NQE database.
P	PREEMPTED. The request was preempted. When a request is preempted, a restart file is created.
Q	QUEUED. The request is in a queue and is eligible for routing or running.
R	ROUTING. The request is being routed to another queue (no minor status is associated with this status).

R	RUNNING. The request is in a batch queue and is currently being processed.
S	SUSPENDED. The request is executing in a batch queue, but its execution was suspended.
U	UNKNOWN. The state of the request cannot be determined.
W	WAITING. The request is prevented from proceeding by a date and/or time constraint imposed at the time of submission (by the `cqsub -a` or `qsub -a` command), by the inaccessibility of a pipe queue destination, or because a license cannot be obtained.
no entry	`<CHANGING STATE>`. The status of the request is changing. This request status can also be displayed if the request was moved into the running subqueue but the associated session has not yet been created, if the NQS daemon aborted or hung while the request was running, or if the shepherd process is taking a long time to process the request exit.

10.3.2 Substatus Codes

The minor status or substate of a request can be one of the following codes:

Status/Substate	Description
number	The number of currently active processes started by the request.
ce	(Cray MPP systems only) The complex Cray MPP processing element (PE) limit was reached.
cg	The complex group run limit was reached.
cm	The complex memory limit was reached.
Comp	The request that was submitted to the NQE database has completed processing.
cq	The complex quickfile (SDS) limit was reached.
cr	The complex run limit was reached.
cu	The complex user run limit was reached.
du	The pipe queue destination is currently unavailable.
ge	(Cray MPP systems only) The global Cray MPP PE limit was reached.

`gg`	The global group run limit was reached.
`gm`	The global memory limit was reached.
`gq`	The global quickfile (SDS) limit was reached.
`gr`	The global run limit was reached.
`gt`	The global tape drive limit was reached.
`gu`	The global user run limit was reached.
`lm`	A license could not be obtained for the request.
`md`	(Cray MPP systems only) The CRAY T3D system is not accessible.
`mp`	(Cray MPP systems only) The CRAY T3D system is accessible but insufficient PEs are available.
`New`	The request is in the NQE database.
`nu`	The NLB server is not available.
`op`	The current major status of the request occurred through operator action.
`Pend`	The request in the NQE database is awaiting scheduling (pending).
`qe`	(Cray MPP systems only) The queue Cray MPP PE limit was reached.
`qg`	The queue group run limit was reached.
`qm`	The queue memory limit was reached.
`qq`	The queue quickfile (SDS) limit was reached.
`qr`	The queue run limit was reached.
`qs`	The queue in which the request resides was stopped.
`qu`	The queue user run limit was reached.
`rj`	(UNICOS systems only) The Unified Resource Manager (URM) rejected the request.
`Sche`	The request is in the NQE database and has been scheduled by the NQE scheduler.
`sh`	The system was shut down.

`Subm`	A copy of the request has been submitted for processing from the NQE database.
`td`	(UNICOS systems only) The UNICOS tape daemon is unavailable and the request asks for tape resources.
`Term`	The copy of the request that was submitted for processing from the NQE database has terminated.
`us`	(UNICOS systems only) The request is in the URM scheduling pool.
`??`	The current status of the request is unknown.

Monitoring Queues [11]

This chapter describes how to use the `cqstatl` command and the `qstat` command to monitor NQS queues. This information does not apply to requests submitted to the NQE database. The following topics are covered:

- Displaying queue summaries (Section 11.1, page 155)
  - Batch queue summary (Section 11.1.1, page 157)
  - Pipe queue summary (Section 11.1.2, page 158)
- Displaying queue details (Section 11.2, page 159)
  - Pipe queue details (Section 11.2.1, page 159)
  - Batch queue details (Section 11.2.2, page 162)
- Displaying batch queue limits (Section 11.3, page 165)
- Monitoring remote queues (Section 11.4, page 166)

  Note: The concept of queues does not exist in the NQE database. Only when a copy of an NQE database request is submitted to a given NQS does it enter a queue. This chapter assumes that the `NQS_DEST_TYPE` variable is set to `nqs`.

Note: If you do not have an NQE license, you cannot access the NQE GUI and the `cqstatl` command. You can access only the `qstat` command from an NQS server.

If the UNICOS multilevel security (MLS) feature or the UNICOS/mk security enhancements are enabled on your system and NQS is configured to enforce mandatory access control (MAC), your active label must dominate the job submission label for you to receive status information. To display the job submission and execution label information for a specific job, use the `cqstatl -f` or `qstat -f` command. NQS managers and operators bypass the MAC checks.

11.1 Displaying Queue Summaries

NQS uses both batch and pipe queues. To display a summary of a specific type of queue, use one of the following `cqstatl` or `qstat` command options:

Option	Description
`-b`	A summary of all batch queues
`-p`	A summary of all pipe queues

To display summary information about all NQS queues at your NQS server, use either the `cqstatl` command or the `qstat` command; for example:

```
cqstatl
```

The display produced by this command includes information about pipe and batch queues.

Often this is a large display and will scroll off your screen. To control scrolling, redirect the output from `cqstatl` or `qstat` to the `more`(1) command; for example:

```
cqstatl | more
```

For example, the following display shows a summary of all NQS queues:

```
% cqstatl
-----------------------------
NQS BATCH QUEUE SUMMARY
-----------------------------
QUEUE NAME              LIM TOT ENA STS QUE RUN  WAI HLD ARR EXI
--------------------- --- --- --- --- --- ---  --- --- --- ---
nqebatch                5  11 yes  on   9   2    0   0   0   0
--------------------- --- --- --- --- --- ---  --- --- --- ---
latte                   5  11           9   2    0   0   0   0
--------------------- --- --- --- --- --- ---  --- --- --- ---
-----------------------------
NQS PIPE QUEUE SUMMARY
-----------------------------
QUEUE NAME            LIM TOT ENA STS QUE ROU  WAI HLD ARR DEP  DESTINATIONS
--------------------- --- --- --- --- --- ---  --- --- --- ---  -------------
nqenlb                  1   0 yes  on   0   0    0   0   0   0
--------------------- --- --- --- --- --- ---  --- --- --- ---  -------------
latte                   5   0           0   0    0   0   0   0
--------------------- --- --- --- --- --- ---  --- --- --- ---  -------------
```

11.1.1 Batch Queue Summary

The last line in the batch queue summary display shows the name of the server and the total for the server. The individual columns have the following meanings:

Column name	Description
QUEUE NAME	The name of the queue.
LIM	The maximum number of requests that can execute in this queue simultaneously. When this limit is reached, other requests in the queue will remain queued until a request already in the queue completes execution.
TOT	The total number of requests currently in the queue.
ENA	The availability of the queue (that is, whether the NQE administrator has enabled the queue). If the queue is enabled (if ENA is yes), the queue can accept requests.
STS	The status of the queue (that is, whether the NQE administrator has started the queue). If the queue has been started (STS is on), the queue will accept and queue requests. If the queue has not been started (STS is off), the queue will accept and queue requests, but it will not execute them.
QUE	The number of requests in the queue that are queued and ready to execute. Queued requests have not begun execution because the queue has not been started (STS is off) or because starting any of the requests would exceed a system limit. For a description of system limits, see Section 4.10, page 67.
RUN	The number of executing requests in the queue.
WAI	The number of requests in the queue that are waiting to be executed. Requests can be waiting for a specified time. They also can wait for a license.
HLD	The number of requests the NQE administrator has put into the hold state.

ARR	The number of requests currently arriving from other queues.
EXI	The number of requests currently terminating their processing.

11.1.2 Pipe Queue Summary

The last line in the pipe queue summary display shows the name of the server, the maximum number of requests that can be processed in all pipe queues at one time, and the total number of requests in each state for all pipe queues. The individual columns have the following meanings:

Column name	Description
QUEUE NAME	The name of the pipe queue.
LIM	The maximum number of requests that can be processed in this queue at any one time. A request can still be placed in the queue when this limit is reached, but it will not be processed until the processing of a request in the queue is complete.
TOT	The total number of requests currently in the queue.
ENA	The availability of the queue (that is, whether the NQE administrator has enabled the queue). If the queue is enabled (if ENA is yes), the queue can accept requests.
STS	The status of the queue (that is, whether the NQE administrator has started the queue). If the queue has been started (STS is on), the queue will accept and route requests. If the queue has not been started (STS is off), the queue will accept requests, but it will not route them.
QUE	The number of requests in the queue that are awaiting processing.
ROU	The number of requests in the queue that are being routed to another queue.
WAI	The number of requests in the queue that are waiting to be processed at a specific time.

HLD	The number of requests the NQE administrator has put into the hold state.
ARR	The number of requests arriving from other queues.
DEP	The number of requests on their way to another queue.
DESTINATIONS	A list of the destination queues for this pipe queue.

11.2 Displaying Queue Details

To display full details about NQS queues, you can use either the `cqstatl -f` command or the `qstat -f` command ; for example:

```
cqstatl -f
```

As with the summary display, you can use the `-b` and `-p` options on the `cqstatl` or `qstat` command line to restrict the display to a particular type of queue. See Section 11.1, page 155.

To restrict the detailed display to a particular queue, you can use one of the following formats:

`cqstatl -f` *queue*

`qstat -f` *queue*

11.2.1 Pipe Queue Details

The following screen shows an example of a detailed pipe queue display for a pipe queue called `nqepipe`:

The fields in this display have the following meanings:

```
% cqstatl -f nqenlb
-------------------------------------
NQS PIPE QUEUE: nqenlb@pendulum    Status:      ENABLED/INACTIVE
-------------------------------------
                                        Priority:    63
<ENTRIES>
     Total:          0

     Running:        0       Queued:         0       Waiting:        0
     Holding:        0       Arriving:       0       Departing:      0
<DESTINATIONS>
     nqebatch@chemcray
<SERVER>
     /usr/craysoft/nqe/bin/pipeclient CRI_DS

<ACCESS>
     Route: Unrestricted            Users: Unrestricted

<CUMULATIVE TIME>
     System Time:    0.00 secs       User Time:      0.00 secs

<ATTRIBUTES>
     C90
     chemdept
     nastran
```

Field	Description
Initial heading	The queue type (`BATCH` or `PIPE`), the name of the queue, and the NQS server at which it is located.
`Status`	The current status of the queue can be one of the following:

Status	Description
`ENABLED`	Requests can be accepted into the queue.
`DISABLED`	Requests cannot be accepted, although NQS is running at the NQS server. The NQS operator has disabled the queue.

	`LOADED`	Requests cannot be accepted, although NQS is running at the NQS server. The queue is a `loadonly` queue that has reached its request limit. When a request leaves the queue, it will return to an `ENABLED` status.
	`CLOSED`	Requests cannot be accepted because NQS is not running at the NQS server.
`Priority`		Interqueue priority. Determines the order in which NQS looks at the queues for work.
`ENTRIES`		The total number of requests in the queue and the number of requests in the following states: running, holding, queued, arriving, waiting, and exiting.
`DESTINATIONS`		A list of the destination queues to which requests in this queue may be sent. The order of the names in this chapter is the order in which NQS considers the queues for forwarding a request. If no destinations are listed, the queue is a destination-selection queue used for load balancing.
`SERVER`		The name of the NQS pipeclient process used to handle routing of requests into and out of this pipe queue. The string `CRI_DS` indicates that the queue is a destination-selection queue used for load balancing.
`ACCESS`		Indicates any restrictions on requests entering the queue.
		The `Route:` subheading can have two values, as follows:
	`Unrestricted`	A request can be submitted to this queue directly.
	`Pipeonly`	A request can enter this queue only from another pipe

queue. You cannot submit a request directly to this queue.

The `Users:` subheading indicates whether any user or group restrictions exist for this queue. The subheading can have two values, as follows:

`Unrestricted`	Any user's request can enter the queue.
`Restricted`	Requests from only specified users and groups can enter the queue. Look under the `<ACCESS>` heading for a list of the valid user names and user groups whose requests can enter the queue.

`CUMULATIVE TIME`	The system and user time accumulated by all requests in the queue since NQS was initiated.
`ATTRIBUTES`	A list of queue attributes. Queue attributes are strings supplied by the `qmgr set attribute` command. The attributes determine which requests are accepted into this queue. If a request specifies an attribute that the queue does not have, that request is not accepted. If a queue has no attributes, this field is not displayed and the queue will accept requests with any list of attributes.

11.2.2 Batch Queue Details

The following example shows a detailed display of an NQS batch queue called `nqebatch`:

```
% cqstatl -f nqebatch
-------------------------------------
NQS BATCH QUEUE: nqebatch@latte        Status:          ENABLED/INACTIVE
-------------------------------------
                                              Priority:       30
<ENTRIES>
        Total:          11
        Running:        2       Queued:         9       Waiting:        0
        Holding:        0       Arriving:       0       Exiting:        0
<RUN LIMITS>
        Queue:          5       User: unspecified       Group: unspecified
<COMPLEX MEMBERSHIP>
<LOCAL SCHEDULER EXTENSIONS>
        Miser Queue: unspecified      Scheduling Window: 0:0.0
<RESOURCE USAGE>
                                   LIMIT                ALLOCATED
        Memory Size             unspecified (unlimited)   524288kw 0kb
        Quick File Space        unspecified (unlimited)        0kw 0kb
        MPP Processor Elements  unspecified (unlimited)        0   0
<RESOURCE LIMITS>
                                PER-PROCESS             PER-REQUEST
        type a Tape Drives                              unspecified (0)
        type b Tape Drives                              unspecified (0)
        type c Tape Drives                              unspecified (0)
        type d Tape Drives                              unspecified (0)
        type e Tape Drives                              unspecified (0)
        type f Tape Drives                              unspecified (0)
        type g Tape Drives                              unspecified (0)
        type h Tape Drives
        Core File Size          unspecified (256mw)
        Data Size               unspecified (256mw)
        Permanent File Space    unspecified (100mb)     unspecified (0b)
        Memory Size             unspecified (256mw)     unspecified (256mw)
        Nice Increment                 0
        Quick File Space        unspecified (0b)        unspecified (0b)
        Stack Size              unspecified (256mw)
```

```
        CPU Time Limit          unspecified (720000sec)   unspecified (720000sec)
        Temporary File Space    unspecified (0b)        unspecified (0b)
        Working Set Limit       unspecified (256mw)
        MPP Processor Elements                          unspecified (0)
        MPP Time Limit          unspecified (10sec)     unspecified (10sec)
        Shared Memory Limit                             unspecified (0mw)
        Shared Memory Segments                          unspecified (0)
        MPP Memory Size         unspecified (256mw)     unspecified (256mw)
<ACCESS>
        Route: Unrestricted            Users: Unrestricted
<CUMULATIVE TIME>
        System Time:    605.70 secs     User Time:      764.03 secs
```

See Section 11.2.1, page 159, for a description of most of the fields in this display. The batch queue display does not contain the `DESTINATIONS` field.

This display contains the following four fields that the pipe queue display does not contain:

Field	Description
`RUN LIMITS`	The limit on the maximum number of concurrently executing requests for the entire queue, for one user, and for one user group.
`COMPLEX MEMBERSHIP`	The names of the queue complexes of which this queue is a member.
`LOCAL SCHEDULER EXTENSIONS`	Information about any local scheduling extensions that have been enabled for the queue; typically, the name of a Miser scheduler queue and the defined scheduling window.
`RESOURCE USAGE`	The potential maximum and the cumulative usage of resources by requests currently executing in the queue. The default values are displayed in parentheses.
`RESOURCE LIMITS`	The maximum per-process and per-request resource values that can be requested by a request to enter the queue. The default values are displayed in parentheses.

11.3 Displaying Batch Queue Limits

To display a list of the limits that the NQE administrator defined for all NQS batch queues, you can use either the `cqstatl -l` command or the `qstat -l` command (lowercase L); for example:

```
cqstatl -l
```

The following screen shows an example of this summary display (`pendulum` is the NQS server). The last line in the display shows the global limits for the NQS server:

```
% cqstatl -l
----------------------------
NQS BATCH QUEUE LIMITS
----------------------------
QUEUE NAME                RUN       MEMORY          QUICKFL     USR GRP
----------------------- --- --- ------- ------- ------- ------- --- ---
nqebatch                  5/0        --/0            --/0        --  --
----------------------- --- --- ------- ------- ------- ------- --- ---
pendulum                  5/0        **/0            --/0         2  --
----------------------- --- --- ------- ------- ------- ------- --- ---
```

Some columns in this display have two entries separated by `/`. The first entry is the limit set for the queue. The second entry is the current use. The `--` symbols mean that no limit has been specified explicitly for the queue. The `**` symbols mean that the item is unlimited.

The columns in this display have the following meanings:

Column name	Description
`QUEUE NAME`	The name of the batch queue.
`RUN`	The number of requests that can execute simultaneously (the *queue run limit*), followed by the number that are currently executing.
`MEMORY`	The maximum amount of memory that all requests in the queue can use at one time, followed by the amount currently being used. A value of 0 for the first entry means that the amount of memory available to this queue is unlimited. Values are expressed in units of 1024 words.

QUICKFL	The maximum amount of quickfile secondary data segments (SDS) space that a request can use, followed by the amount currently being used. Values are expressed in units of 1024 words.
USR	The maximum number of requests that one user can have executing in the queue at any one time (the *queue user run limit*).
GRP	The maximum number of requests that one user group can have executing in the queue at any one time (the *queue group run limit*).

11.4 Monitoring Remote Queues

NQE can route your requests to NQS queues at a server other than your NQS server (as defined by NQS_SERVER). You can display information about remote NQS queues by doing one of the following:

- Use either the `cqstatl -h` command or the `qstat -h` command and supply the network host name of an NQS server. For example, the following command displays a summary status of all NQS queues at a server called `hot`:

  ```
  cqstatl -h hot
  ```

- Include the host when you specify a queue, as follows:

  queue@*target_host*

  For example, the following command displays full details about the NQS queue `single` at the NQS server `hot`:

  ```
  cqstatl -f single@hot
  ```

If password validation is in force, you must include the `cqstatl -P` option or set the NQS_PASSWORD_NEEDED environment variable to ensure that you are prompted for a password.

If both password and file validation are in force, you do not have to set the environment variable or specify the `cqstatl -P` command. Your validation files are checked as described in Section 2.8, page 27.

If validation files are checked, the `cqstatl` or `qstat` command is successful only if your user name is included in a validation file at the NQS server. For more information on file validation, see Section 2.5, page 26.

If the UNICOS MLS feature or the UNICOS/mk security enhancements are enabled on your system, you cannot display information from a remote host if the execution host has a workstation access list (WAL) entry for the host of origin that restricts your access to NQS services.

Deleting Requests [12]

This chapter describes how to delete batch requests. It discusses the following topics:

- Deleting your requests (Section 12.1, page 169)
- Deleting requests on another NQS server (Section 12.2, page 174)
- Deleting another user's request (Section 12.3, page 175)

Note: If you do not have an NQE license, you cannot access the NQE GUI and the `cqdel` command. You can access only the `qdel` command from an NQS server.

12.1 Deleting Your Requests

After submission, a request is routed to a batch queue. The request then waits in the batch queue until the NQS system is ready to execute it. While a request is being routed by a pipe queue or is waiting to execute in a batch queue, you can delete it in the following ways:

- By selecting the `Actions` menu `Delete Job` option on the NQE GUI `Status` window
- By using either the `cqdel` command or the `qdel` command.
- By sending a signal to it as described in Section 12.1.3, page 172.

Note: When you delete a request, the original file is not deleted, just the request to execute the file.

To delete a request, you must be validated using the same method that is used for submitting requests. For further information about passwords and validation files, see Chapter 2, page 21.

If the UNICOS multilevel security (MLS) feature or the UNICOS/mk security enhancements are enabled on your system and NQS is configured to enforce mandatory access controls (MAC), your active label must equal the job submission label if your job is queued; your active label must equal the job execution label if your job is executing. If you specified the `-C` or `-L` options on the `cqsub` or `qsub` command line or specified an alternative active security compartment or level by selecting `Submit->Configure->General Options` when the job was submitted, the job execution label may not be the same as the

job submission label. To display the job submission and execution label information for a specific job, you can use either the `cqstatl -f` or `qstat -f` command, or you can select `Status->Actions->Detailed Job Status`. NQS managers and operators bypass the MAC checks.

12.1.1 Using the NQE GUI

You can use the procedure described in this section to delete a request that was sent to NQS or a request that was sent to the NQE database. You can delete a request by selecting `Delete Job` on the `Actions` menu of the NQE GUI `Status` window.

> **Note:** You can use the NQE GUI to delete a request whether or not the request is executing.

If your site uses password validation, you must either set the `NQS_PASSWORD_NEEDED` environment variable or, in the NQE GUI `Submit` window, select `Set Password` on the `Actions` menu to ensure that you are prompted for a password; otherwise, your request will not execute. The password you supply is for the user name under which the request will execute.

After you submitted the request to be executed, you received a response similar to one of the following:

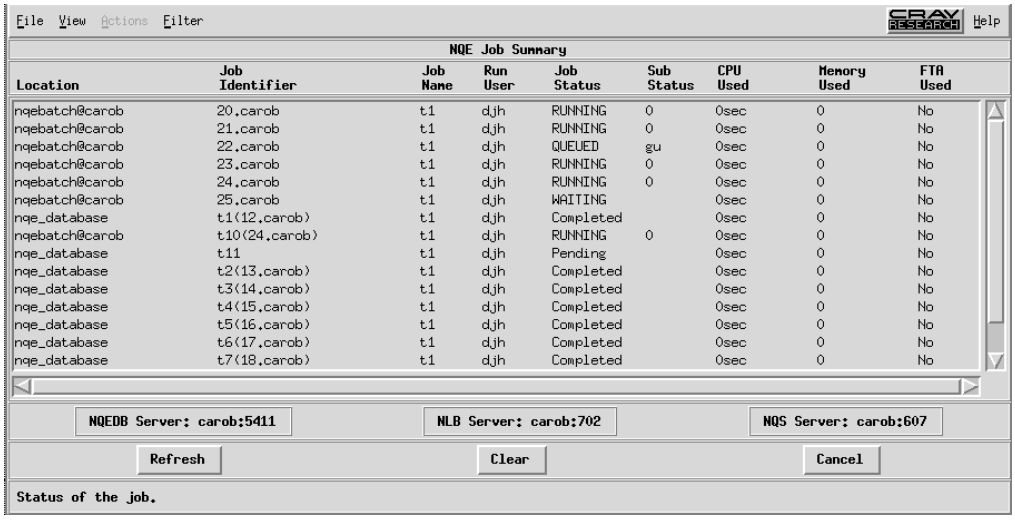
- If you submitted your request to NQS, you received a response similar to the following:

  ```
  Request 46.latte submitted to queue: nqenlb
  ```

- If you submitted your request to the NQE database, you received a response similar to the following:

  ```
  Task id t4 inserted into database nqedb
  ```

To display its status, use the NQE GUI `Status` window. See Figure 15 for a sample NQE GUI `Status` window. The Location column of the display shows requests submitted to NQS (in the format of *queue*@*host*) and requests submitted to the NQE database (in the format of `nqe_database`).



a10375

Figure 15. NQE GUI `Status` Window Example

Highlight the request in the job summary area, select the `Actions` menu, and then select `Delete Job`, which deletes the currently selected request from the job summary area. You will receive a response stating that your request was deleted.

For a summary of the NQE GUI `Status` options, see the `nqe`(1) man page.

12.1.2 Using the `cqdel` Command or the `qdel` Command to Delete a Request Not Executing

You can use only the `cqdel` command to delete a request from the NQE database. To use the `cqdel` or `qdel` command to delete a request that was sent to a specific destination, provide the NQE database task ID (for `cqdel` only) or the NQS request ID on the command line. For example, to delete request `46.latte` that was sent to NQS, you would enter the following command:

```
% cqdel -d nqs 46.latte
Request 46.latte has been deleted.
```

If a request has already begun execution, the following message is displayed when you issue the `cqdel` command:

```
% cqdel -d nqs 5167.sequoia
QUESR: ERROR: Failed to delete request "5167.sequoia"
QUESR: ERROR: Request is running at transaction peer
```

The `cqdel` command or `qdel` command used without options does not affect an executing request. You can delete the request by using the NQE GUI `Status` window, as described in Section 12.1.1, page 170, or you can signal the request by using the `cqdel -k` command or the `qdel -k` command, as described in Section 12.1.3, page 172.

Note: If your site uses password validation, you must include the `cqdel -P` option or set the `NQS_PASSWORD_NEEDED` environment variable to ensure that you are prompted for a password. The password you supply is for the user name under which the request will execute.

For a summary of the `cqdel` and `qdel` command options, see the `cqdel`(1) and `qdel`(1) man pages.

12.1.3 Using the `cqdel` Command or `qdel` Command to Delete an Executing Request

If you use the NQE GUI, the method described in Section 13.1.1, page 179, works whether or not the request is executing.

You can use only the `cqdel` command to delete a request from the NQE database. If you use the `cqdel` or `qdel` command to delete an executing request, you must send the request a signal by using one of the following command formats; separate a list of NQS request identifiers (*requestids*) or NQE database task identifiers (`t`*ids*) with a space:

`cqdel [{-k | -s` *sig_name* `| -`*signo* `} ] [`*requestids* `| t`*ids*`]`

`qdel [ {-f | -k | -s` *sig_name* `| -`*signo* `} ]` *requestids*

For example, to use the `cqdel -k` command to delete a request from the NQE database that has a task identifier of `t135`, you would enter the following command; the command deletes the request, but the task remains in the NQE database with a status of `Terminated`:

```
% cqdel -d nqedb -k t135
NQE Task "t135" has been signalled (Acknowledged).
```

Note: If your site uses password validation, you must include the `cqdel -P` option or set the `NQS_PASSWORD_NEEDED` environment variable to ensure that you are prompted for a password. The password you supply is for the user name under which the request will execute.

You can specify the `qdel -f` command to delete both a request and the job output.

For a summary of `cqdel` and `qdel` command options, see the `cqdel`(1) and `qdel`(1) man pages.

The following screens show the submission and signaling of a request in an NQS queue. In this example, the request is submitted using the `cqsub` command:

```
% cqsub -q nqebatch t1
Request 21.carob submitted to queue: nqebatch
```

Next, the NQE GUI `Status` window is used to display its status, as shown in Figure 16:

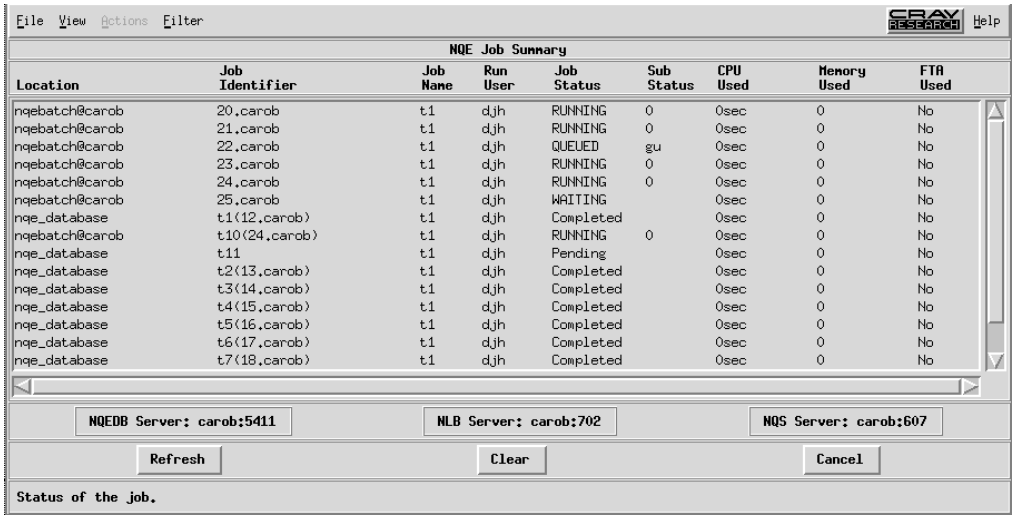


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Figure 16. NQE GUI `Status` Window Example

Then the executing request is signaled (deleted):

```
% cqdel -k 21.carob
Request 21.carob is running and has been signaled.
```

12.2 Deleting Requests on Another NQS Server

If a request has been routed to a queue at a server not on your local NQS server (which is defined in NQS_SERVER), you can delete it by using either the NQE GUI Status window or the cqdel command or qdel command to delete or signal it.

> **Note:** If your request was submitted to the NQE database, delete the request by selecting Delete Job on the Actions menu of the NQE GUI Status window as described in Section 12.1.1, page 170.

If you are using the NQE GUI, to delete a request on another NQS server, select Delete Job on the Actions menu of the NQE GUI Status window as described in Section 12.1.1, page 170.

If you use the cqdel or qdel command, you must specify the name of the NQS server as part of the command line. You can do this by using one of the following command options:

-h *target_host requestids*
request@hostname ...

For example, either of the following commands deletes a request that currently resides on a remote server named peat but was originally submitted at a local system called coal:

```
cqdel -h peat 450.coal
cqdel 450@peat
```

If password validation is enforced at the local system, you will be prompted for a password. The password requested is for the user name at the remote host under whom the request will execute. If both password validation and validation files are in force at the remote system, you can simply press RETURN when prompted for a password; the validation file is then checked. If validation files are checked, the qdel command will be successful only if your user name is included in a validation file at the remote system. For more information about passwords and validation files, see Chapter 2, page 21.

If the UNICOS MLS feature or the UNICOS/mk security enhancements are enabled on a remote system, you cannot delete a request at the remote host if the host has a workstation access list (WAL) entry for the host of origin that restricts your access to NQS services.

12.3 Deleting Another User's Requests

Deleting requests requires the same validation that is used for submitting requests. NQS will then search for a validation file. For NQE database requests, you can delete only requests that were submitted with your database user name. For more information on NQS validation, see Chapter 2, page 21.

If you use the NQE GUI, you can delete a request by selecting `Delete Job` on the `Actions` menu of the NQE GUI `Status` window as described in Section 12.1.1, page 170.

If you use the `cqdel` or `qdel` command to delete requests owned by another user, you can use the following command formats:

`cqdel -d` *dest_type* `-u` *username* [*requestids* `|` t*ids*]

`qdel -u` *username requestids*

The *username* is the name of the user specified by the `-u` option.

In the following example, the `cqdel` command deletes a request that has identifier `1173.coal` submitted by `sandy` (assuming you are authorized correctly):

```
cqdel -d nqs -u sandy 1173.coal
```

The following `cqdel` command deletes a request that was sent to the NQE database; the request has a task identifier of `t100` and was submitted by the NQE database user name `sandy` (assuming you are authorized correctly):

```
cqdel -d nqedb -u dbuser=sandy t100
```

In the following example, if you are logged in as user `sam` to a UNICOS operating system called `coal` and want to delete a request submitted by a user called `sandy`, the following entry must be in the `.rhosts` or `.nqshosts` file in the home directory of `sandy`:

```
coal sam
```

If this entry exists, the following `qdel` command deletes a request submitted by `sandy` that has the identifier `1173.coal` :

```
qdel -u sandy 1173.coal
```

The `-u` option may not be valid for remote requests that use file validation on UNICOS MLS or on UNICOS/mk security-enhanced systems. When the UNICOS MLS feature or the UNICOS/mk security enhancements are enabled on your system, the system might be configured to require

the`/etc/hosts.equiv` and `.rhosts` files to each contain a match for the remote host and to require that the remote user and local user names match (that is, the `-u` option is not allowed).

Signaling Requests [13]

This chapter describes the signaling process. The following topics are discussed:

- Signaling your requests (Section 13.1, page 177)
- Signaling another user's requests (Section 13.2, page 182)

Note: If you do not have an NQE license, you cannot access the NQE GUI and the `cqdel` command. You can access only the `qdel` command from an NQS server.

For information about deleting running requests by using the `cqdel -k` command or the `qdel -k` command, see Section 12.1.3, page 172.

13.1 Signaling Your Requests

You can send a signal to any request, whether or not the request is executing. If the request is not yet executing, the request is deleted, no matter which signal is sent.

You can send a signal to one or more of your requests by using either the NQE GUI `Status` window or the `cqdel` command or the `qdel` command.

Standard output, standard error, and job log files are produced for an executing request that is deleted by a signal. These files record the execution of the request up to the moment when the signal is received. The files are returned to the submitting user through the normal output return mechanisms.

If you submitted the request to NQS, an executing request is a request that is in an NQS batch queue and has the letter `R` (running), `H` (held), or `S` (suspended) under the `Job Status` field of the NQE GUI `Status` window or under the `ST` column of the `cqstatl` or `qstat` display.

If you submitted the request to the NQE database, an executing request is a request that is in the NQE database and has the letter `N` (in the NQE database), `R` (running), `H` (held), or `S` (suspended) under the `Job Status` field of the NQE GUI `Status` window or under the `ST` column of the `cqstatl` or `qstat` display.

Note: A request in the NQE database is known as a task and is assigned a task ID (t*id*). When a copy of the request is executing under NQS, it also is assigned a request ID (*requestid*), and it is displayed in parentheses after the t*id* in the NQE GUI `Status` window `Job Identifier` field.

Three of the most common signals that you can send to a request are as follows:

Signal	Description

`SIGINT`	Interrupts the executing request, flushes buffers, and displays a traceback. Examples of the `SIGINT` command follow:
	`cqdel -d nqs -s SIGINT 25.pendulum`
	`cqdel -d nqedb SIGINT t123`
	`qdel -s SIGINT 123.abc`

`SIGQUIT`	Does the same as `SIGINT`, but it also writes a core file.
`SIGKILL` or `-k`	Kills the executing request and all processes that the request started without flushing I/O buffers, displaying a traceback, or writing a core file.

However, you can send any valid signal. To catch some signals for error handling or postprocessing, you can include code in the job request script.

The following Korn or standard shell example traps (using `trap`) the `SIGCPULIM` signal and copies a data file into the user home directory from `$TMPDIR.` (For `SIGCPULIM`, there is a small grace period before the job is killed, during which the user can do some quick clean-up processing.)

```
#QSUB -s /bin/sh
set -x
postproc ()
      {
     echo "pp: SIGCPULIM caught"
     echo "pp: copying $TMPDIR/data to $HOME/save.data"
     cp $TMPDIR/data $HOME/save.data
      }
trap postproc 26
echo "begin program that creates file: $TMPDIR/data"
$HOME/bin/program
```

13.1.1 Using the NQE GUI `Status` Window

You can send a signal to one or more of your requests by using the NQE GUI `Status` window. For each request you want to signal, highlight the request in the job summary area, select the `Actions` menu, and then select `Signal Job`. A dialog box appears and asks you to select a signal to send. Select the signal you want to send by clicking on one of the signal buttons. The dialog box disappears and the job is signaled. A second dialog box will appear with a reply from the signal request. After you review the reply, click on the `OK` button and the process is complete.

> **Note:** If your site uses password validation, you must either set the `NQS_PASSWORD_NEEDED` environment variable or, in the NQE GUI `Submit` window, select `Set Password` on the `Actions` menu to ensure that you are prompted for a password; otherwise, your request will not execute. If you do not set the environment variable or the NQE GUI for password prompting and you use the NQE GUI, the NQE GUI will still prompt you for your password. The password you supply is for the user name under which the request will execute.

The following is an example of how to signal a request using the NQE GUI.

After you submitted the request to be executed, you received a response similar to one of the following:

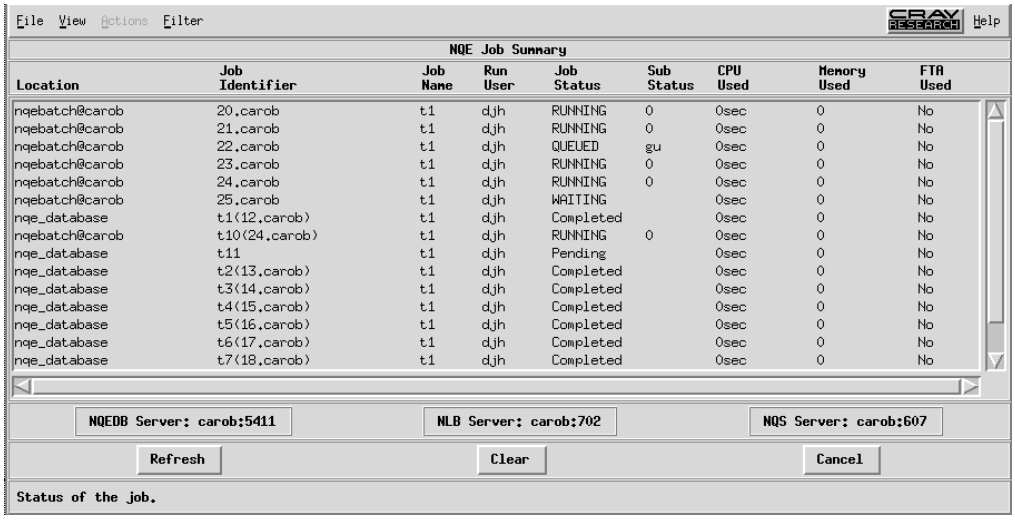
- If you submitted your request to NQS, you received a response similar to the following:

  ```
  Request 46.latte submitted to queue: nqenlb
  ```

- If you submitted your request to the NQE database, you received a response similar to the following:

  ```
  Task id t4 inserted into database nqedb
  ```

To display its status, use the NQE GUI `Status` window. Figure 17 shows an example of the NQE GUI `Status` window:



a10375

Figure 17. NQE GUI `Status` Window Example

Highlight the request in the job summary area, select the `Actions` menu, and then select `Signal Job`. A dialog box appears and asks you to select a signal to send. To delete the request, select the `SIGKILL` signal by clicking on one of the signal buttons. The dialog box disappears and the job is signaled. A second dialog box appears with a reply from the signal request stating that your request was deleted. After you review the reply, click on the `OK` button.

For a summary of the NQE GUI `Status` options, see the `nqe`(1) man page.

13.1.2 Using the `cqdel` or the `qdel` Command

You can use only the `cqdel` command to signal a request from the NQE database. To send a signal to one or more of your own requests, use one of the following command formats; separate a list of NQS request identifiers (*requestids*) or NQE database task identifiers (`t`*ids*) with a space:

```
cqdel [{-k | -s sig_name | -signo}] [requestids | tids]
```

```
qdel [{-k | -s sig_name | -signo}] requestids
```

The `-k` option sends a `SIGKILL` signal to the running request.

The `-s` *sig_name* and `-`*signo* options both send a signal to a request. The only difference is the way in which the signals are specified.

Because various platforms may use different numbers for a given signal, you may want to use the `-s` option, rather than the signal number, to specify a signal name. If you know the signal number for the platform on which your request is running, however, the `-`*signo* option will work equally well.

The *requestids* argument specifies one or more requests executing under NQS.

The `t`*ids* argument specifies one or more requests in the NQE database; a request in the NQE database is known as a task and is assigned a task ID (`t`*id*).

> **Note:** If your site uses password validation, you must include the `cqdel -P` option or set the `NQS_PASSWORD_NEEDED` environment variable to ensure that you are prompted for a password. The password you supply is for the user name under which the signal request will execute.

To display a list of all your requests that are still in NQS queues, use the `qstat -a` command. To tell whether a request is executing, use the `qstat` *requestids* command.

To tell whether a request is executing, use the `qstat` command, as follows:

`qstat` *requests*

```
% qstat 454.coal
------------------------------
NQS 3.1 BATCH REQUEST SUMMARY
------------------------------
IDENTIFIER    NAME    USER     QUEUE                JID  PRTY REQMEM REQTIM ST
------------ ------- -------- -------------------- ---- ---- ------ ------ ---
454.coal       sleeper snow     b_30_5@coal            319   23    192     30 R02
%
```

For a summary of the `cqdel` and the `qdel` command options, see the `cqdel`(1) and the `qdel`(1) man pages.

13.2 Signaling Another User's Requests

If your site uses both validation files and password checking, you can delete a request without using a password. NQS will then search for a validation file. For more information on NQS validation, see Section 2.4, page 25.

Note: For requests submitted to the NQE database, you can signal only the requests in the NQE database that were submitted by the same database user.

If you use the NQE GUI, you can signal a request by selecting `Signal Job` on the `Actions` menu of the NQE GUI `Status` window as described in Section 13.1.1, page 179.

If you use the `cqdel` or the `qdel` command to signal requests you submitted under another user name, use one of the following command formats; separate a list of NQS request identifiers (*requestids*) or NQE database task identifiers (`t`*ids*) (used only with the `cqdel` command) with a space:

```
cqdel [-k | -s sig_name | -signo] -u username -d nqs requestids
```

```
cqdel [-k | -s sig_name | -signo] -u username -d nqedb tids
```

```
qdel [-k| -s sig_name | -signo] -u username requestids
```

Note: If your site uses password validation, you must include the `cqdel -P` option or set the `NQS_PASSWORD_NEEDED` environment variable to ensure that you are prompted for a password. The password you supply is for the user name under which the signal request will execute.

The following `cqdel` command signals a request that has identifier `1173.coal` submitted by `sandy` (assuming you are authorized correctly):

```
cqdel -2 -u sandy 1173.coal
```

You will receive the following response:

```
Request 1173.coal is running and has been signaled.
```

Transferring Files [14]

You can transfer files between remote systems on a network either from within a batch request or interactively by using the NQE File Transfer Agent (FTA). The `ftua` and `rft` commands transfer files. The `ftua` interface to FTA is similar to the TCP/IP `ftp` utility. File transfers can be initiated only on NQE nodes.

This chapter discusses the following topics:

For a complete description of the `ftua` commands, see the `ftua`(1) man page.

For a complete description of the `rft` commands, see the `rft`(1) man page.

14.1 File Transfer Terms

The following terms are commonly used with the File Transfer Agent (FTA):

- A *file transfer service* is a program that provides FTA with access to a network system that uses a specific file transfer protocol.
- A unique FTA *domain_name* is assigned to each of the file transfer services that are available to FTA. A domain name is subsequently used to identify a specific transfer service.
- *network peer-to-peer authorization* (NPPA) lets users transfer files without sending a password across the network. It requires FTA on the local system and support for network peer-to-peer authorization on the remote system. It can be used to authorize both batch and interactive file transfers.
- A *file transfer request* is an object containing information that describes the file transfer operations to be performed by FTA on behalf of a user. Each request is a separate file, which is located in the FTA queue directory.
- A *queue directory* is a file system directory that contains file transfer request files.

14.2 Using ftua

To transfer files to and from a remote host, use the following command:

```
ftua
```

Note: You can use this command only on NQE nodes.

The `ftua` command uses the File Transfer Agent (FTA) component of NQE to transfer files.

You might choose to use FTA for the following reasons:

- You can queue your transfers. You can execute file transfers immediately or queue them for later execution. If the transfer is queued, it is executed after you leave the utility, letting you proceed to other tasks.
- You can display queued transfers. If you have issued a file transfer request in queue mode, you can display details about the request. To view the status of an FTA transfer, you can use either the NQE GUI or the `qls` command.
- Your transfers are retried. If your file transfer fails for some transient reason (such as a network link failing), FTA automatically requeues the transfer. Retries are useful in batch requests because your requests will not abort if a transfer cannot occur when it is first tried.
- You do not have to provide passwords. FTA provides network peer-to-peer authorization (NPPA). NPPA lets you transfer files without specifying passwords in either batch request files or in `.netrc` files or by transmitting passwords over the network. For more information on NPPA, see Section 14.5, page 213.
- It provides both synchronous and asynchronous reliable file transfer. If a transient error condition occurs during the transfer, transfers are retried. Retries are useful when transferring files from within an NQS request.

To start the `ftua` utility, type `ftua` and press `RETURN`. The `ftua` prompt (`ftua>`) appears.

```
$ ftua
ftua>
```

At this point, you can execute any `ftua` commands that do not require a connection to a remote host. Examples are `domain`, `open`, and `help`.

14.2.1 Selecting a Domain

The `ftua` utility lets you connect to any transfer service that is configured by your administrator. To select the file transfer service to which you want to connect, use the following command:

`ftua> domain` *domain_name*

The default value of *domain_name* is `inet`.

If you are transferring files to or from another NQE system, use `nqe` as the *domain_name.*

If you are transferring files to or from a non-NQE system, use `ftp` as the *domain_name*.

14.2.2 Connecting to a Remote Host

To connect to a remote host, use the following command:

`ftua> open` *hostname*

The following example shows a connection sequence to a host with verbose mode on. Verbose mode displays all `ftua` messages. The domain name is `nqe`. The remote host is `ice`, and the user ID is `you.`

```
ftua> verbose
Verbose mode on.
ftua> domain nqe
250 SITE command successful.
ftua> open host5
250 SITE command successful.
Name (ice:you):
Password:
250 PASS command successful.
ftua>
```

You can include your user name and password for the remote host in the `.netrc` file on the system from which you issue the `ftua` command, as described in Section 14.4, page 211. If you do, you are not prompted for a user name or password.

If you are using NPPA, you can press `RETURN` at the password prompt. For a description of NPPA, see Section 14.5, page 213.

A shortcut for establishing an `ftua` connection is to type `ftua`, a host name, and a domain name after the operating system prompt, as shown in the following example:

```
$ ftua ice nqe
Name (ice:you):
Password:
ftua>
```

FTA inserts your user name on the local host. If you have the same user name on the remote host, you can press `RETURN` and type in your password.

A connection with the remote host is established immediately, and you can execute any `ftua` command.

14.2.3 Selecting a Mode

The `ftua` utility can execute file transfers in one of two modes:

- *immediate mode* transfers the file immediately after you type a command. You cannot type any more `ftua` commands until the file transfer completes. A message informs you of the success or failure of the transfer. If the file transfer fails, you must reenter the command.
- *queue mode* queues the request to await execution. The queue contains requests from all `ftua` users. The request is not executed until you exit `ftua`. If you enter the `wait` command, the transfer is completed first, and then the session is ended. Queue mode is normally used when you do not want to wait for a transfer to complete before continuing, but you want to be sure the transfer will complete successfully. Using queue mode, if the communications link fails in the middle of the transfer, FTA will requeue the transfer automatically.

  If the file transfer fails with a transient error, the request remains in the queue and can be recovered as described in Section 14.2.20, page 208.

  In queue mode, by default, you are sent a mail message for each request that fails. You can request that a mail message be sent to you to report either the success or the failure of the file transfer request by using the following command:

  ```
  ftua> notify
  ```

When you first enter `ftua`, you are in immediate mode, unless you use the `-q` command line option to change to queue mode, as follows:

```
ftua -q ice nqe
```

After you enter `ftua`, you also can type `queue` and press `RETURN` to enter queue mode. To return to immediate mode, type `immediate` and press `RETURN`. To determine your current mode, look at the last line of the display produced by the `status` command, as shown in the following example:

```
ftua> queue
ftua> status
Connected to sun20.
No proxy connection.
Mode: stream; Type: ascii; Form: non-print; Structure: file
Verbose: off; Bell: off; Prompting: on; Globbing: on
Store unique: off; Receive unique: off
Case: off; CR stripping: on
Ntrans: off
Nmap: off
Hash mark printing: off; Use of PORT cmds: on
Queue mode: on
ftua>
```

14.2.4 Specifying the Type of File to Transfer

You can specify the type of file you want to transfer by using the following command:

`ftua>` *filetype*

The type of files supported varies, depending on the *domain_name* you use and the underlying file transfer protocol selected. The following *filetypes* are available:

- `ascii` (file contains ASCII, or character, data; the line boundary structure of the file is preserved)
- `binary` (file contains binary data; no interpretation is made of the data within the file, and the remote system stores the file so that the file can be retrieved unchanged)
- `ebcdic` (`rft` does not support this file type)

- `image` (has the same effect as binary file transfers; `rft` does not support this file type)
- `tenex` (sets type to local byte size and has the same effect as binary file transfers; `rft` does not support this file type)

For additional information about file types supported, see the `ftua`(1) and `rft`(1) man pages.

14.2.5 Copying Files from a Host

To copy a file from a remote host to your current directory on the local system, use the following command:

`get` *remote_file local_file*

File names can be full path names or relative to the working directory.

The following example shows the messages displayed if you are in immediate mode with verbose mode on. If verbose mode is off, messages are not displayed after the `get` command line.

```
ftua> get file1 file2
200 FILE command successful.
220 Command completed.
```

If you omit *local_file*, `ftua` uses *remote_file* to name the file on the local system.

14.2.6 Copying Files to a Host

To copy a file from the local system to your home directory on a remote host, use the following command:

`put` *local_file remote_file*

File names can be full path names or relative to the working directory. The following example shows the messages displayed if you are in immediate mode with verbose mode on:

```
ftua> put file1 file2
200 FILE command successful.
220 Command completed.
```

If you omit *remote_file*, `ftua` uses *local_file* to name the file on the remote system.

14.2.7 Copying Multiple Files

To copy multiple files to a remote host, use the following command:

`mput` *filenames*

The *filenames* argument is a list of local file names; you can also designate multiple file names by using file name globbing (that is by using wildcard characters) to copy all files at one time. (Globbing is on by default. For summary information on globbing, see the `ftua`(1) man page.) File names can be full path names or relative to the working directory.

> **Note:** The `ftua` utility has no equivalent command to copy multiple files from a remote host to your directory on the local system.

Interactive prompting is on by default. If interactive prompting is on, you are asked to verify whether you want each file to be transferred. The following command opens a connection to host `ice` using domain `nqe` and turns off interactive prompting for multiple file transfers:

```
ftua -i ice nqe
```

You can toggle prompting on or off. To see the current setting for prompting, use the `status` command. To change the setting, use the `prompt` command, as shown in the following example:

```
ftua> prompt
Interactive mode off.
ftua> prompt
Interactive mode on.
ftua>
```

The following example shows the transfer occurring with interactive prompting enabled and verbose mode off. The interactive prompt lets you cancel the transfer of one or more of the files designated on the command line.

```
ftua> mput file1 file2 file3
mput file1? y
mput file2? n
mput file3? y
```

14.2.8 Copying Files to and from IBM MVS Systems

The `ftua` block mode is primarily used to transfer Cray Research binary-blocked files between UNICOS and IBM's Multiple Virtual Storage Operating System (MVS) FTP. To perform successful `get` and `put` operations, the remote FTP server must support the FTP block transfer mode. (For text file transfers, use the default FTP ASCII mode transfer.)

Records must be disassembled or assembled into FTP blocks to facilitate transfer. When executing a block mode `put` of a file, the `ftua` client uses the Cray Research flexible file input/output system (FFIO) to read each record from the UNICOS file. The record is sent to the remote FTP server using as many FTP blocks as necessary to complete the transfer; these FTP blocks are reassembled into a record on the remote side. When executing a block mode `get`, FTP blocks are read and stored until end-of-record is encountered; these FTP blocks are written to a file as one record using FFIO. In either case, the remote FTP server must perform complementary actions, assembling or disassembling records into or from FTP blocks.

Currently, the only FTP server known to support block transfer mode in this manner is that provided by IBM's TCP/IP for MVS. Refer to the manuals supplied with this product for more information on using IBM's FTP server. The remainder of this section assumes that this is the FTP server you are using.

To use block mode file transfers successfully, you must have knowledge about the size of the data records to be transferred, the file structure on UNICOS, and the dataset structure on MVS. Use sets of `ftua` commands to inform the FTP client (`ftua`) and the MVS FTP server about the necessary file attributes and record size, as follows:

- For the UNICOS file, use a qualifier in the local file specification on the `put` or the `get` command to specify the FFIO attributes. (FFIO attributes are described in the *Application Programmer's I/O Guide*, publication SG–2168.)
- For the MVS dataset, use the `ftua site` command to send information to the server about the dataset characteristics. (A subset of these parameters is similar, but not identical, to a subset of the parameters on the MVS `DD JCL` command.)

Note: To see the parameters accepted by the `site` command for the remote server, enter the following:

```
ftua> rhelp site
```

You can use the `verbose` command to see warning messages sent by the remote server that may help to diagnose problems with `site` command parameters.

- Use the `ftua blkmdsize` command to specify the maximum-size FTP block to be used by `ftua` when sending a file in block mode.

14.2.8.1 Executing a `get` Command

To receive a dataset from MVS to a UNICOS file within an `ftua` session, take the following steps:

1. Use the `ibmblock` command to set `mode` to `block` and `type` to `ebcdic`. Typically, you do not need to specify a `site` command if you want the server to read the dataset using the attributes stored in the MVS catalog.
2. On the `get` command, append the FFIO attributes in parenthesis to the local file specification to describe how the file should be written on UNICOS. `ftua` uses FFIO to write a file whenever `mode` is `block`. If no FFIO attribute is specified, the file is written in UNICOS binary blocked format. (FFIO `cos` format as shown in the specific example.) The `get` command syntax follows:

```
get remote_file local_file (ffio_attributes)
```

A specific example of the `get` command follows:

```
ftua> get mvsqual.dsn  crayfile(cos)
```

14.2.8.2 Executing a `put` Command

To send a UNICOS file to an MVS dataset within an `ftua` session, take the following steps:

1. Use the `ibmblock` command to set `mode` to `block` and `type` to `ebcdic`.
2. When creating a new MVS dataset, use the `site` command to specify its characteristics.

3. Depending on the maximum record size of the UNICOS file, and the blocksize and record format of the MVS dataset, you may need to use the `blkmdbsize` command to specify the maximum size of each FTP block that `ftua` will send to the server. The default FTP block size used by `ftua` is 16384 bytes.

```
blkmdbsize size_in_bytes
```

4. On the `put` command, you must append the FFIO attributes in parenthesis to the local file specification to describe how the UNICOS file should be read. `ftua` uses FFIO to read a file whenever `mode` is `block`. If no FFIO attribute is specified, the file is assumed to be in UNICOS binary blocked format (FFIO `cos` format). The `put` command syntax follows:

```
ftua> put local_file (ffio_attributes) remote_file
```

A specific example of the command follows:

```
ftua> put crayfile(cos) mvsqual.dsn
```

Caution: Be careful when specifying UNICOS FFIO and MVS dataset attributes. In many cases, if you accept the default values or specify values inconsistent with the structure of the UNICOS file or MVS dataset, the file transfer may complete without error, but the records in the dataset may be truncated or otherwise incorrect.

The default dataset characteristics for datasets created by the FTP server can be customized by the MVS system administrator. Depending on your application, you may want to explicitly specify key `site` parameters to minimize the reliance on particular `site` defaults.

Caution: Use only one `site` command per session. Unexpected side-effects may occur as a result of new default values overriding values specified on previous `site` commands. Also, many `site` command parameters apply only to datasets created by FTP; if the dataset already exists, existing characteristics may be used without warning.

You can use the server `stat` command to get a listing of the current status of many of the server's current transfer settings.

```
ftua> rquote stat
```

Avoid the use of `recfm=v` or `recfm=vbs` because you may receive results that are not valid without warning.

For files with arbitrary-sized records or records larger than 32768 bytes, use datasets with characteristics `recfm=vbs` and `lrecl=x`. Use the `blkmdbsize` command to set the FTP transfer size to be 8 bytes less than the MVS `blocksize`. For example:

```
ftua>  ibmblock
ftua> blkmdbsize 32752
ftua> site recfm=vbs lrecl=x blocksize=32768
ftua> put crayfile(cos) mvsqual.dsn
```

Some choices for `blkmdbsize` and blocksize versus record size may lead to inefficient storage of the MVS dataset. In general, choose values such that the smaller of the average record size or the `blkmdbsize` is close to but less than (`blocksize` - 8). A complete discussion of UNICOS file formats, MVS dataset characteristics, their interaction with FTP settings, and of data storage efficiency is beyond the scope of this section.

Remember that the FFIO specification is for the UNICOS file format, not the MVS dataset. Unless the UNICOS file is already in an IBM format, do not use FFIO IBM format specifications.

14.2.9 Appending Files

To append a local file to a remote file, use the following command:

```
append local_file_name remote_file_name
```

The file name can be a full path name or relative to the working directory.

The following example appends the contents of the local file `this` to the remote file `that`:

```
ftua> append this that
```

14.2.10 Deleting Files

To delete a file from the remote host, use the following command:

```
delete filename
```

The file name can be a full or relative path name.

The following example deletes the remote file `file1`:

```
ftua> delete file1
```

14.2.11 Displaying Queued Transfers

If you have issued a file transfer request in queue mode, you can display details about the request in the following ways:

- You can use the NQE GUI. For each request that has an FTA transfer associated with the request, the NQE GUI `Status` window's `View` menu `Job Summary` display contains a `Yes` in the `FTA Used` column.

  You can view the status of an FTA transfer in the following ways:

  – Using the `Status` window, select the `View` menu `FTA Summary` option which displays a one-line summary of all transfers.

    To display a detailed status of a specific transfer, place the pointer over the transfer name and double-click the left mouse button. To cancel the detailed `FTA Summary` display, click on the display's `Cancel` button by using the left mouse button.

  – Using the `Status` window's default `Job Summary` display, highlight the request by placing the pointer on the request line and clicking on the left mouse button. Select the `Actions` menu, and then select `Detailed FTA Status`. To cancel the `Detailed FTA Summary` display, click on the display's `Cancel` button by using the left mouse button.

- You can use the `qls` command. To obtain a one-line list of all your file transfer requests that are currently in the queue, use the `qls` command, as shown in the following example. A unique queue identifier located in the `QID` column identifies each file transfer request:

```
ftua> qls
--QID-- ---Queued On --- --User-- ---State--- -----Status-----
aa12972 Mon Jan  5 22:05 george   Active      UA connected
aa12977 Mon Jan  5 22:15 george   Active      UA connected
```

- To display details of all requests currently in the queue, use the `qdir` command. To display more details about a particular request, use the `qdir` *identifier* command, as follows:

```
ftua> qdir aa12972
--QID-- ---Queued On --- --User-- --Group--
aa12972 Mon Jan  5 22:05 george   cray
        State: Active
        Status: UA connected
        Priority: 0
        Last Attempt: Never
        Controlling PID: 12972
        Domain: nqe
        Host: sun20
        Username: george
        Copy (put)
                LocalFile: /home/sun401/george/verse1
                RemoteFile: verse1
```

14.2.12 Aborting Transfers

To abort a file transfer when operating in immediate mode, press the terminal interrupt key (usually `CONTROL-c`), as in the following example:

```
ftua> get file1 file2
CONTROL-c
```

If you used the `put`, `mput`, or `append` command, it is halted immediately. If you used a `get` command, it may take a little time before it ends, depending on the domain that you selected.

To delete a transfer in queue mode, use `qdelete` followed by the queue identifier for the request, as follows:

```
ftua> qdelete aa12977
```

To obtain the queue identifier for a request, see Section 14.2.11, page 195.

14.2.13 Waiting for Transfer Requests

The `wait` command blocks your use of `ftua` until FTA completes the queued request. After the request has completed, `ftua` exits, as in the following example:

```
latte% ftua -qv ice ftp
Connected to localhost.
220 latte FTA server (Version 5.0 (11.1)) ready.
250 QMOD command successful.
250 DOMA command successful.
200 SITE command successful.
Name (ice:jane):
331 Password required for jane.
Password:
200 Login to remote fts successful.
ftua> get x.x
200 FILE command successful.
220 COPY command queued (aa000LP).
ftua> wait
Waiting for request aa000LP...
Request aa000LP completed.
latte%
```

The `wait` command does not guarantee successful file transfer. If a request fails as a result of a transient error, it is requeued but not recovered. For information on FTA recovery, see *NQE Administration*, publication SG–2150.

14.2.14 Closing a Connection or Ending a Session

To close a connection to a host but remain in `ftua`, use either the `close` or the `disconnect` command, as in the following example:

```
ftua> close
221 Goodbye.
ftua>
```

To end the `ftua` session, use either the `bye` or `quit` command, as in the following example:

```
ftua> bye
$
```

14.2.15 `ftua` Examples

This section provides an example of using `ftua` in its immediate and queue modes. For a summary of `ftua` commands, see the `ftua`(1) man page.

- First Jane wants to access a remote host called `moon`. She types `ftua` and the remote host name `moon` (`moon` is an NQE system), followed by the domain name `nqe`.

```
$ ftua moon nqe
Name (moon:jane):
Password:
ftua>
```

- Jane wants to transfer several files immediately, without having to queue them. She does not want to be prompted for each file, so she turns off interactive prompting.

```
ftua> prompt
Interactive mode off.
ftua>
```

- Jane is now ready to copy the files to host `moon`. Because all of the file names begin with the prefix `janedata`, Jane uses file name globbing (that is uses wildcard characters) to copy all files at one time. (Globbing is on by default. For summary information on globbing, see the `ftua`(1) man page.)

```
ftua> mput janedata*
ftua>
```

  As you can see, no information is displayed about the actual transfers that occurred.

  If Jane wants some information about the transfers, she can turn on verbose mode before executing `mput`:

```
ftua> verbose
Verbose mode on.
ftua> mput janedata*
200 FILE command successful.
220 Command completed.
200 FILE command successful.
220 Command completed.
200 FILE command successful.
220 Command completed.
ftua>
```

To display even more information, Jane can set the debug feature to be on, as in the following example:

```
ftua> debug 1
Debugging on (debug=1).
ftua> mput janedata*
---> FILE /sub/jane/janedata1
200 FILE command successful.
---> STOR janedata1
220 Command completed.
---> FILE /sub/jane/janedata2
200 FILE command successful.
---> STOR janedata2
220 Command completed.
---> FILE /sub/jane/janedata3
200 FILE command successful.
---> STOR janedata3
220 Command completed.
```

- Jane closes the connection to host `moon`, as follows:

```
ftua> close
ftua>
```

- Jane wants to copy a file called `weather.oct` on her local host to host `neptune`. `weather.oct` is a large file, and Jane does not want to wait until it completes before continuing, but she does want to be sure the transfer will complete successfully.

Because the link to `neptune` has a reputation for being unreliable, Jane decides to execute the transfer in queue mode. That means she does not have to stay in `ftua` until the transfer completes. However, she can still be sure that, if the communications link fails in the middle of the transfer, FTA will requeue the transfer automatically.

Before opening the connection to `neptune`, Jane enters queue mode.

Because `weather.oct` contains binary data, Jane selects a file transfer type of `binary` before requesting the transfer.

```
ftua> queue
ftua> open neptune dec
Name (neptune:jane):
Password:
ftua> binary
ftua> put weather.oct
ftua>
```

- Jane wants to examine the queue to see whether her transfer request is there. Because she cannot remember the command to use, however, she types `help` to get a list of command names, and then she types `help` followed by the command name (`qdir`) to ensure that she has the correct command.

```
ftua> help
Use ‘help <command>’ to get help on commands.
Commands may be abbreviated. Commands are:
!              dir            mdir           qdelete        setdefault
$              disconnect     mkdir          qdir           site
account        domain         mls            qls            status
append         form           mode           queue          struct
ascii          get            moveout        quit           trace
bell           glob           mput           quote          type
binary         help           nlist          recv           user
blkmdbsize     ibmblock       nmap           rename         umask
bye            immediate      notify         reset          verbose
cd             image          ntrans         rmdir          wait
cdup           lcd            open           rhelp          ?
close          lhelp          prompt         rquote
delete         ls             put            runique
debug          macdef         pwd            send
ftua> help qdir
qdir            list contents of file transfer queue (long)
ftua>
```

To see details about queue entries, Jane types the `qdir` command:

```
ftua> qdir
--QID-- ---Queued On --- --User-- --Group--
aa15872 Tue Jan  6 17:25 jane     cray
        State: Active
        Status: UA connected
        Priority: 0
        Last Attempt: Never
        Controlling PID: 15872
        Domain: nqe
        Host: neptune
        Username: jane
        Copy (put)
                LocalFile: /sub/jane/weather.oct
                RemoteFile: weather.oct
ftua>
```

- Because Jane wants to receive mail when the file transfer request succeeds, she types the following command before ending the `ftua` session:

```
ftua> notify success on
ftua>
```

- When Jane ends the `ftua` session, the queued file transfer is processed. Jane uses the following command to end the `ftua` session; any active `ftua` connections are also closed by using this command:

```
ftua> bye
$
```

14.2.16 `macdef` Example

The `macdef` command lets you define macros within `ftua`. A macro definition is in effect only for the current `ftua` session. To save macro definitions, put them into the `.netrc` file. For more information on the `.netrc` file format, see Section 14.4.1, page 211.

The following example illustrates the use of the `macdef` command to define a macro called `newdir`. The macro `newdir` creates a new directory at the remote machine by using a path name (`/sub/jane/test`) supplied as the first argument on the macro command line. It then changes the current directory to be the newly created one and displays the current directory.

Within the macro definition, a `$` followed by a numeral (or numerals) is replaced by the corresponding argument on the command line when the macro is invoked. For example, `$1` is replaced with the first command line argument.

An empty line terminates the macro input mode.

```
$ ftua chemistry nqe
Name (chemistry:jane):
Password:
ftua> macdef newdir
Enter macro line by line, terminating it with a null line
mkdir $1
cd $1
pwd

ftua> $ newdir /sub/jane/test
220 "/sub/jane/test" is current directory.
ftua>
```

Macros remain defined until you execute a `close`, `bye`, or `quit` command.

14.2.17 Transferring Files from within a Request File

To initiate a file transfer from within a request file, you can use `here` document syntax, as in the following example:

```
ftua -in machine nqe << EOF
fred_bloggs
password
get remote_file
quit
EOF
```

The `<<` signals the construction of the `here` document. The word that follows (`EOF` in this case) is the string used to delimit the input, meaning that the next occurrence of the string on a line by itself is the end of the `here` document.

To initiate file transfers, you can use either `ftua` or `rft`, with or without the use of passwords.

To use `ftua` or `rft` in `nopassword` mode, both machines must have network peer-to-peer authorization (NPPA) enabled as described in Section 14.5, page 213.

You can use the following syntax in the request file to transfer files to and from a machine called `aardvark` that has the domain `nqe`. Both of the following examples use NPPA for user authentication. If NPPA is not used, `ftua` or `rft` requires a password.

The following example shows `ftua` used in a batch request:

```
ftua -in aardvark nqe << EOD
smith                           #<--- username
                                #<--- blank line for NPPA
get file1                       #<--- ftua request
binary                          #<--- ftua request
get file2                       #<--- ftua request
put file                        #<--- ftua request
quit                            #<--- exit ftua
EOD
```

The following example shows `rft` used in a batch request (for an explanation of using the `rft` command, see Section 14.3, page 209):

```
rft -function get that_file1 new_file -user smith \
-host aardvark -domain nqe -type binary -nopassword
```

14.2.18 Using `ftua` with the UNICOS Multilevel Security (MLS) Feature or UNICOS/mk Security Enhancements

When the UNICOS multilevel security (MLS) feature or the UNICOS/mk security enhancements are running on your system, use the `ftua` command to transfer classified files from a UNICOS MLS or UNICOS/mk security-enhanced system to a remote node. If you use `ftua` on the remote node, you can transfer only files at the active security label assigned to you at login. There is no mechanism for changing your security label within `ftua`.

When you have logged into your UNICOS MLS or UNICOS/mk security-enhanced system, set your active security label to that of the file you wish to transfer, then execute the `ftua` command. You must be in a directory that can accommodate a file created at your active security label. If the remote node supports your security label you can transfer the file. Files that are transferred to the UNICOS MLS or UNICOS/mk security-enhanced system are labeled with your active security label at the time of file creation. The examples that follow illustrate common transfer procedures under MLS and their results.

In example 1, Jill wants to transfer the file called `testdata` from `cray` to `snoopy`. `testdata` has a security level of 1 and the `test` compartment. Jill adjusts her security level and compartment settings to match the file's security level and compartment. She then executes the `ftua` command, but is denied access because the network access list (NAL) entry for `snoopy` does not support this level or compartment.

Example 1:

```
cray$ spget -f testdata
Security Values for: testdata
   level:   1
   level1
compartments:   010
   test
   class:   0
   class0
categories:   0
   none
   flags:   0
   none
cray$ setulvl 1
setulvl: New security label is Level[1:level1]
Compartments[none]
cray$ setucmp test
setucmp: New security label is Level[1:level1]
Compartments[test]
cray$ ftua snoopy
ftua: connect: Permission denied
ftua> quit
```

In example 2, Jill tries to transfer the file to `friend`. The transfer is successful because the NAL entry for `friend` supports her security label.

Example 2:

```
cray$ ftua friend
Connected to friend
220 friend ftua server (Version 4.15 Fri Mar 6 14:20:46 PST 1998)
ready.
Name (friend:jill):
331 Password required for jill.
Password:
230 User jill logged in.
ftua> put testdata
200 PORT command okay.
150 Opening data connection for testdata (234.6.12.4,1035).
226 Transfer complete.
ftua> quit
```

In example 3, Jill tries to transfer a file to `cray` from `friend`. First, she changes to a directory where she can create a file with a security level of 1 and the `test` compartment. The transfer is successful because the NAL entry for `friend` supports her security label, and the file can be created in her current directory.

Example 3:

```
cray$ cd level1/test
cray$ ftua friend
Connected to friend
220 friend ftua server (Version 4.15 Fri Mar 6 14:20:46 PST
1998) ready.
Name (friend:jill): jill
331 Password required for jill.
Password:
230 User jill logged in.
ftua> get friend.file
200 PORT command okay.
150 ASCII data connection for friend.file (128.162.82.15,1187
226 ASCII Transfer complete.
ftua> quit
211 Goodbye.
$ spget -f friend.file
Security Values for: friend.file
   level:   1
   level1
compartments:   10
   test
   class:   0
   class0
categories:   0
   none
   flags:   0
   none
```

14.2.19 File Naming Conventions

Files specified as arguments to `ftua` commands are processed according to the following rules:

- If you use wildcard characters (that is, if globbing is enabled), local file names are expanded according to the rules used in the C shell, `csh`(1).
- If `get` commands do not specify a local file name, `ftua` uses the remote file name. To alter this, use an `ntrans` or `nmap` setting.
- If you do not specify a remote file name for `mput` and `put` commands, `ftua` uses the local file names. To alter this, use an `ntrans` or `nmap` setting.

- If you specify the file name `-`, the standard input (for reading) or standard output (for writing) is used. This file naming option is not available to Action commands, which are listed in the `ftua`(1) man page.

For summary information on globbing, `ntrans` and `nmap`, and a listing of the Action commands, see the `ftua`(1) man page.

14.2.20 Failure Notification

Transfer requests you make in queue mode are processed after you exit `ftua`. During the processing of a request, one of the following might occur:

- The request completes successfully.
- A failure occurs that prevents the request from being started. In such cases, the request is removed from the queue.

  A failure also could occur during the execution of the request. For example, the request could involve getting two files from the remote system, but one of the files does not exist. If possible, all valid actions in a request are completed, but some failures could mean that the request cannot be processed any further, and so it is removed from the queue.
- A transient error occurs. A transient error is a temporary error that prevents the request from being processed at the current time. For example, the remote system involved in the request could be down, but it might become available later.

  If a transient error occurs, the request remains in the queue and can be retried. Generally, the NQE administrator sets up an automatic recovery process that retries such requests at regular intervals. It is possible for you to recover your own files; for further information, see *NQE Administration*, publication SG–2150.

To request that a mail message be sent to you when a request completes successfully or when a failure occurs, use the following command:

```
ftua> notify
```

By default, a mail message is sent only if a failure occurs. For failures, the mail message includes a description of the failure that has occurred, as follows:

```
To: fred
From: MAILER-DAEMON (File Transfer Agent)
Subject: File transfer aa17087 (failed)
Status: R
```

```
File transfer request aa17087 has failed.
Diagnostic message follows:

  Login incorrect.
Request description and status follows:

--QID-- ---Queued On --- --User-- --Group--
aa17087 Mon Mar 23 09:44 fred      craygrp
        State: Active
        Status: Connected
        Priority: 0
        Last Attempt: Mon Mar 23 09:44:48
        Controlling PID: 17091
        Domain: nqe
        Host: cray1
        Username: fred
        Copy (get)
                RemoteFile: .login
                LocalFile: /x/fred/.login
```

To determine whether a transient error has occurred, use the `qls` or `qdir` command. The following screen shows how an example of the display produced by `qls` indicates transient errors:

```
ftua> qls
--QID-- ---Queued On --- --User-- --State-- ----Status----
aa02497 Fri Mar 20 16:19 chris    Queued    Network connection timeout
aa02523 Fri Mar 20 16:29 chris    Queued    Network connection failure
```

14.3 Using `rft`

The `rft`(1) command uses one command line to copy files between the local host and another host. You can use this command on NQE nodes only.

The `rft` command has the following advantages over other file transfer commands:

- It is a one-line interface to FTA. This makes it easier to use in batch job requests.

- It provides both synchronous and asynchronous reliable file transfer. If a transient error condition occurs during the transfer, transfers are retried. Retries are useful when transferring files from within an NQS request.

  If you disable the synchronous feature by selecting the `-nowait` option, the transfers are done in asynchronous fashion but are still reliable.

- `rft` provides an option that deletes the local file on the completion of a transfer. This is useful when transferring files at the end of an NQS request to the system from which you submitted the request.

For a detailed description of the command, see the `rft`(1) man page.

In its simplest form, `rft` can copy a file from a remote system to a file on the local system. The following example transfers `remfile` on `host2` to `locfile` on the local host:

```
rft -user jake -password Zapx -host host2 -function get  \
  remfile locfile
```

You can abbreviate the options, such as `-user`, if the abbreviation is not ambiguous. For instance, you cannot abbreviate `-host` as `-h`, because it might be confused with the `-help` option. You can, however, abbreviate `-host` as `-ho`.

Note: When you use `rft` within a script or batch request file, do not abbreviate the options. New options might be implemented that begin with the same sequence as an abbreviated option and thus introduce an ambiguity.

If you are logged on interactively, `rft` will prompt for a password only for the remote host. To suppress the prompt, specify the password on the command line by using the `-password` option. If you do not have to specify a password, use the `-nopassword` option.

To reverse the direction of the file transfer, change the function from `get` to `put`. The source file name is always listed first and the destination file name second, whichever direction the transfer is going. The following command copies `locfile` from the local system to `remfile` on `host2`:

```
rft -user jake -password ZapX -host host2 -function put \
  locfile remfile
```

14.4 Using Autologin

The autologin feature lets you authenticate yourself on a remote system by using a user ID and password that are stored in the `.netrc` file. The `.netrc` file supports autologin for `ftua` commands. You cannot use the autologin feature, however, if you have the UNICOS multilevel security (MLS) feature or the UNICOS/mk security enhancements enabled.

The `.netrc` file is an authorization file that contains host and user information that the remote system verifies before the file transfer session begins. `ftp` also uses the `.netrc` file.

To use autologin, create the `.netrc` file in your home directory. If FTA finds this file, it uses the information to log you in to the remote host automatically. If you do not have an `.netrc` file, the system prompts you for your login name and password.

The `.netrc` file is a simple text file. To create or modify it, you can use any standard text editor, such as `vi`(1).

Although autologin is very convenient, it does present a major security threat to the system. If `.netrc` contains password or account information, FTA requires that the file permissions are set so that the owner of the file has exclusive read and write permissions. Set the file permissions by using the `chmod 600 .netrc` command. If the file permissions allow any other user to read and write the file, your transfer will fail.

14.4.1 Creating `.netrc` File Entries

The `.netrc` file can contain one or more entries. Each entry describes default values and macros to use when connecting to a specified remote host. Each entry is on a separate line. Each entry is composed of token pairs that include a keyword and a *value*.

The recognized keywords are `machine`, `login`, `password`, `account`, and `macdef`.

To separate token pairs, use any of the following characters:

- Space
- Tab
- Newline
- String of characters between two double quotation marks

To embed any of these special delimiter characters into a token pair, precede it with a \ symbol.

The `machine` *remote_hostname* token pair defines the start of an entry.

All other token pairs are optional. You can specify them in any order, though they usually are given in the order that follows. If you omit necessary information from your `.netrc` file, FTA prompts you for it.

> **Note:** The `macdef` *macro_name* token pair is different from the others. After the `macdef` *macro_name* token pair, all characters up to a blank line are assumed to be the definitions of a macro.

The following is a list of the permissible token pairs:

Token pair	Description
`machine` *remote_hostname*	Identifies the name of the remote host to which a connection will be established. When you start `ftua`, the `.netrc` file is searched for a `machine` keyword that matches the remote host name you specify. After a match is found, the subsequent `.netrc` token pairs are processed until the end of the file is reached or until another `machine` keyword is found.
`login` *login_name*	Specifies the name of a user at the remote host. If the `login` keyword is present, the autologin process uses *login_name* to log in to the remote host.
`password` *password*	Specifies a password for *login_name*. If the `password` keyword is present and the `.netrc` file can be read by anyone but the user running `ftua`, the autologin process aborts.
`account` *account_name*	Supplies an additional account password if required.
`macdef` *macro_name macro*	Defines a macro for the `ftua` session. A macro is defined with the specified name. The macro's contents begin with the next `.netrc` line and continue until a blank line is encountered. If a

macro called `init` is defined, it is executed automatically as the last step of the autologin process.

14.4.2 `.netrc` File Example

The following example `.netrc` file contains entries for three different remote hosts. The line `machine biology login bonnie` indicates that, when connecting to host `biology`, you must use the login name `bonnie`. Because the password is omitted, you are prompted for the password during each login process.

The line `machine chemistry login alice` indicates that, when connecting to host `chemistry`, you must use the login name `alice`, and it also defines two macros, `lsf` and `pwdlsf`.

The line `machine blackhole login anonymous password bonnie` is an entry for anonymous `ftua`. The anonymous facility lets you use `ftua` to access another host without having an account or password on that host. The login name for anonymous `ftua` is usually `anonymous`. The password should be a name that describes the user. This example uses the login name `anonymous` and the password `bonnie`. Usually, the anonymous facility is not enabled. When it is enabled, only a limited number of files can be accessed on that host.

```
# .netrc file example

machine biology login bonnie
machine chemistry login alice
    macdef lsf
    ls -CF

    macdef pwdlsf
    pwd
    ls -CF

machine blackhole login anonymous password bonnie
```

14.5 Using NPPA

network peer-to-peer authorization (NPPA) lets you log on to a remote host without sending a password across the network in a request script file, a `.netrc` file, or from the command line. NPPA requires the use of FTA on the local system and support for the NPPA process on the remote system. You can use it to authorize both batch and interactive file transfers.

You must enter the name of your NPPA domain on the `ftua` command line. Ask your NQE administrator for the name.

The following lines in a batch request file transfer a file named `nqeuser.data`:

```
1)  #QSUB -x
2)  ftua -n hot1 nqe << EOF
3)  user nqeuser
4)
5)  get nqeuser.data nqeuser.data
6)  bye
7)  EOF
```

Line	Description
1	Specifies that NQS environment variables are exported.
2	Specifies the name of the host (`hot1`) on which your file is located and the NPPA domain (`nqe`). The characters `<<` begins the `here` document that accepts input until the termination string (`EOF`) is encountered. The `-n` option specifies that you want to use NPPA.
3	Logs you in.
4	Is blank because it sends the `RETURN` that you would press at the password prompt if you were using `ftua` and NPPA interactively.
5	Transfers the `nqeuser.data` file from `hot1` to the execution server.
6	Logs you out of `ftua`.
7	Signals the end of the `ftua` commands in the batch request file.

Monitoring Machine Load [15]

This chapter describes how to monitor machine-load information. The Network Load Balancer (NLB) displays information about the nodes in the NQE cluster. This information is used for load balancing, display of machine load data, and display of request status in the cluster. For more information about cluster-wide request status, see Section 10.1, page 137.

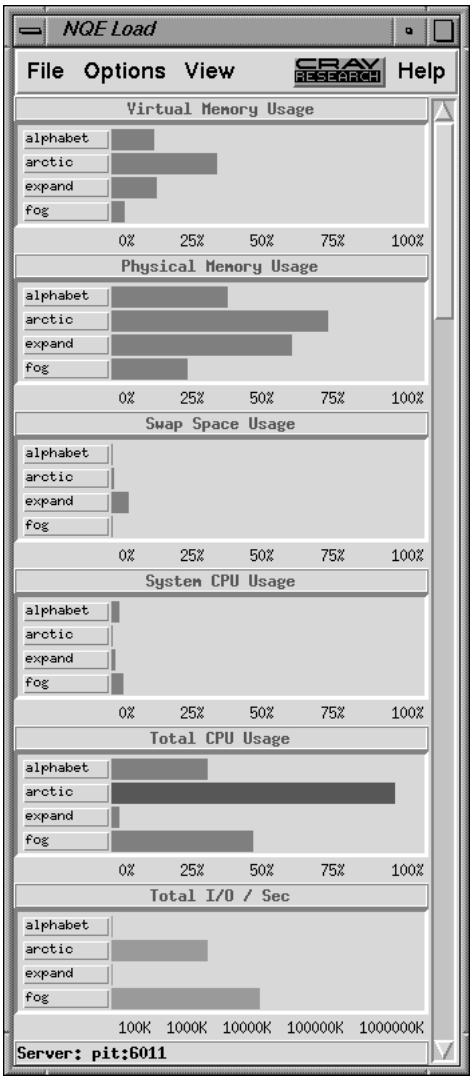
To access machine-load information, click on the `Load` button of the NQE GUI interface. The window provides the following:

- Continually updated status that allows easy comparison of the workload of servers
- Visual indication that a host is not providing new data
- Pop-up windows that provide information on a server

You can customize the display by editing the `.Xdefaults` file or using the `Chart Editor` option on the `Options` menu of the NQE GUI `Load` window (see Section 9.3, page 133, or the `nqe`(1) man page).

You can view data from the main window, by individual host, and through a miniature summary display.

Figure 18 shows the default `Load` window:



a11572

Figure 18. `Load` Window

Note: You can change the settings of the mouse buttons (see Section 9.3, page 133). The settings described in this manual are the default settings.

The `Load` window is composed of the menu bar, the NQE load display, and the server name display area. Each of these segments is described as follows:

- *Menu bar*. The menu bar is located at the top of the `Load` window and displays buttons that open `Load` menus. To open a menu window, place the pointer on the menu name and press the left mouse button.
  - `File` menu. The `File` menu contains the `Exit` option, which closes all of the windows associated with the NQE load display and terminates the program.
  - The `Options` menu contains the `Host Selection` option, which provides selections for hosts that you want displayed, and the `Chart Editor` option, which creates new charts, changes the configuration of an existing chart, and adds or removes a chart from the `Load` window.
  - `View` menu. The `View` menu contains the `Chart Formulae` option, which displays the formula used to calculate each of the charts.
  - `Help` menu. The `Help` menu lets you view the `nqe`(1) man page or view information about how to access this manual.
- *NQE load display*. The NQE load display provides continually updated machine load data for participating machines in the cluster. Each of the charts in the display has a title, a scale, and one button per host.
- *Server name display area*. The server name display area displays the name of the server.

The system load application uses the NLB database information supplied by the `ccollect` program. The `ccollect` program relies on the `sar`(1) command to retrieve system performance data. If you are running UNICOS/mk, the `sar`(1) command will not provide system performance data for memory or swapping usage statistics. Therefore, the NQE `Load` window for memory demand will display a fixed value of `96%` memory demand for the UNICOS/mk platforms.

If you choose `Host Selection` under the `Options` menu, a pop-up filter lets you select which hosts are displayed. Figure 19 shows this filter:

Figure 19. `Host Selection` Filter

If you choose `Chart Editor` under the `Options` menu, a pop-up window lets you select editing options to create a new chart, change the configuration of an existing chart, and add or remove a chart from the `Load` window. Figure 20 shows the `Chart Editor` window.

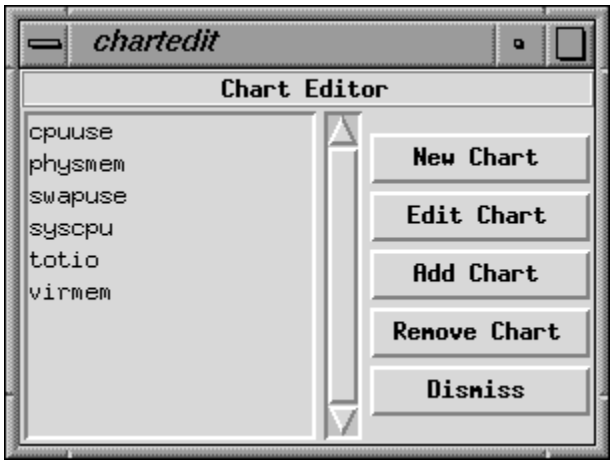


Figure 20. `Chart Editor` Window

If you choose `Edit Chart` in the `Chart Editor` window, a pop-up window lets you select options to change the configuration of an existing chart. Figure 21, page 219 shows the `Edit Chart` window.

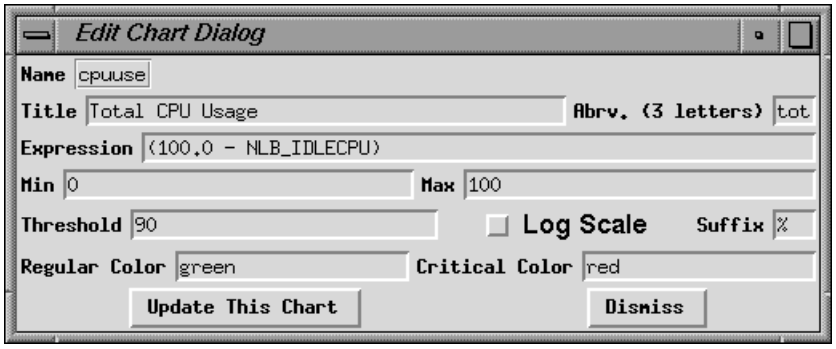


Figure 21. `Edit Chart` Window

If you choose `Chart Formulae` under the `View` menu, you will see the formulae used that result in the charts displayed on the main window. Figure 22 shows this display:

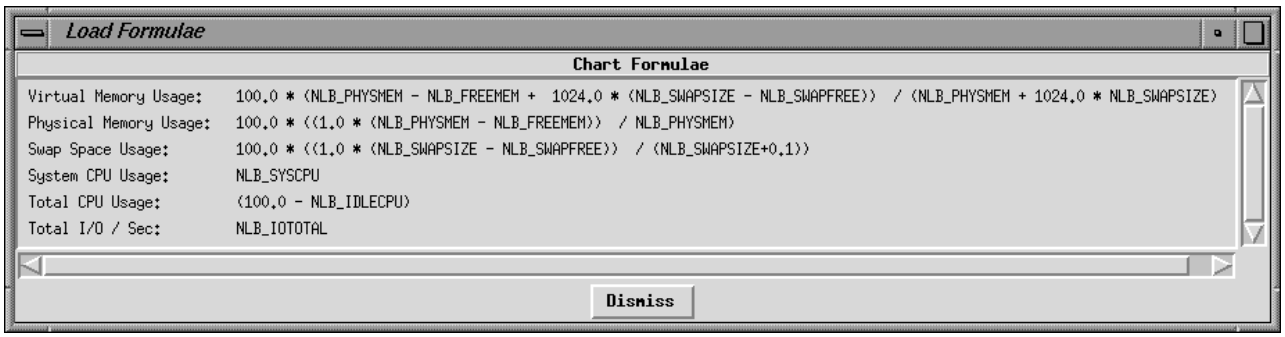


Figure 22. `Chart Formulae` Display

You can view data about a specific host as shown in Figure 23, page 221. You also can view the same data that is provided on the `Load` window (memory demand, percentage of system CPU in use, idle CPU, and total I/O per second) grouped by host rather than by type of data (as shown in Figure 24, page 222).

To display information about a specific host, place the pointer over the button that has the name of the host on the `Load` window and click the left mouse button. You will receive a display like the one shown in Figure 23. When the NLB receives new data, this display is updated.

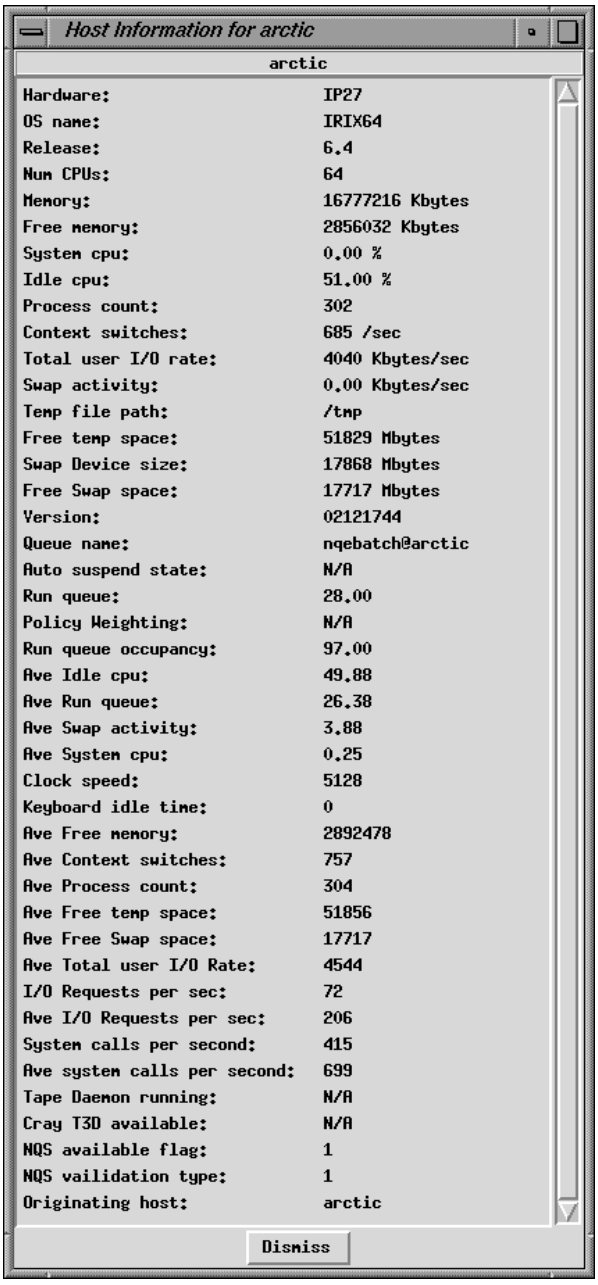


Figure 23. Load Display for Specific Host

To cancel this window, click on the `Dismiss` button at the bottom of the window or click the left mouse button over the host name in the `Load` window.

To display a window of data that is grouped by host rather than by type of data, position the pointer over the host name on the `Load` window and click the middle mouse button. As you select additional hosts, the window will expand and include a display for each host you select. Figure 24 shows the load summary displayed for four hosts that were selected individually:

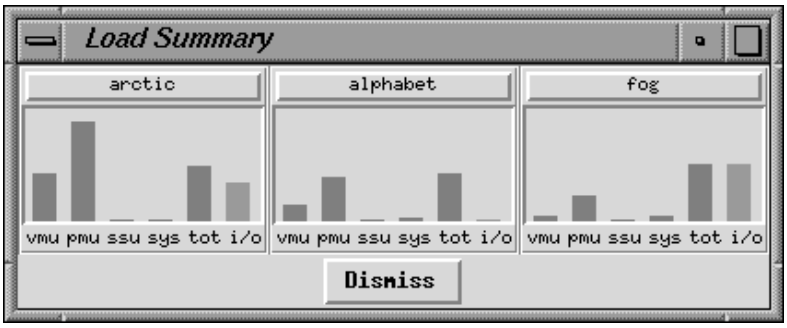


Figure 24. NLB `Load Summary` Displayed by Host

To execute an `rlogin` command for a host, position the pointer over the host name and click on the left mouse button.

To cancel a host summary display, as shown in Figure 24, click the middle mouse button over the host name in the `Load` window. Repeat this action for each host summary you want to cancel.

Solving Problems [16]

This chapter describes some problems that you may have when using NQE, along with their possible solutions. The following problems are discussed:

If your request does not complete successfully, you will receive either an error message in the standard error file or a mail message that describes the problem; your job log may also be appended to your mail, depending on which `cqsub` or `qsub` command options are set.

16.1 Commands Do Not Execute

Before you can use the NQE commands, you must add the */nqebase*`/bin` directory (and the */nqebase*`/etc` directory to use administrator commands) to

your search path. Before you can use the man pages (which tell you about the NQE commands and command options) you must add the /*nqebase*/man directories to your search path. For a description of how to set these variables, see Section 2.2, page 22.

16.2 Requests Not Queued

When you try to submit a request to NQS, you may receive the following message:

```
NQS local daemon is not present at local host.
Retry later.
```

This message indicates that the NQS system is not running. You can wait until later or contact your NQE administrator, or you can try using a different NQS server node. If you do not know which systems are NQS server nodes in your NQE cluster, contact your NQE administrator.

If you try to submit a request without specifying a queue name, you may get the following message:

```
No request queue specified, and no local default has been defined.
Request not queued.
```

The message indicates that no default queue is currently defined. You can do any of the following:

- Ask the NQE administrator to define a default queue.
- Using the NQE GUI, select `General Options` on the `Configure` menu of the `Submit` window, enter the name in the `Queue name` field, and apply the change.
- Define your own default queue by using the `QSUB_QUEUE` environment variable (see Section 4.9, page 65).
- Using either the `cqsub` or `qsub` command, specify a queue by using the `-q` *queuename* option.

When you submit a request, you may get the following message:

```
Access denied at local host.
```

This message indicates that the queue to which you submitted the request has access restrictions that prohibit your request entering the queue. The restriction can be any of the following:

- The queue is `pipeonly`, which means that it can accept a request only from a pipe queue.
- Only certain users or user groups can submit requests to the queue.

To determine the access restriction, use the `cqstatl -f` or the `qstat -f` command (see Section 11.2, page 159).

If the UNICOS MLS feature or the UNICOS/mk security enhancements are enabled on your system, and the requested label does not dominate the submission label, you may receive the following message:

```
Unanticipated transaction failure at local host.
```

16.3 Requests Not Executing

If you find that a request remains in a queue for a long time, check the `Status` column of the NQE GUI `Status` window or the `ST` column of the `cqstatl` or `qstat` display, which lists a status code that will help you determine the problem. The following are possible reasons:

- A letter `W` can indicate the following:
  - Your request is waiting for a license (see Section 16.15, page 234).
  - A pipe queue's destination queue is disabled.
  - A pipe queue's destination is at a remote system that is not available. NQS automatically retries sending the request at periodic intervals.
- A letter `Q` that has a substatus code of `qs` indicates the queue has stopped. Only the NQE administrator can start and enable NQS queues.
- A letter `Q` that has a substatus code beginning with `c`, `g`, or `q` (except `qs`) indicates that a limit has been reached for the queue complex, globally on the NQS server, or for a queue. You can wait for resources to become available or delete the request.
- Your request may be accepted into an NQS queue and later be deleted. Check your electronic mail for a message such as the following:

  ```
  The request could not be routed to any of the possible pipe
  queue destinations because of the following reason(s)  :
  ```

```
No account authorization at transaction peer;
```

If you receive this message, one of the following is true:

- Password checking is in use and either you did not request a password prompt (by selecting `Set Password` on the `Actions` menu of the NQE GUI `Submit` window, by using `cqsub -P`, or by setting the `NQS_PASSWORD_NEEDED` environment variable), or you supplied a password that is not valid.
- Validation file checking is in use and no correct entry exists in the validation file of the user name you used to submit the request. See Chapter 2, page 21.
- UNICOS MLS or UNICOS/mk security enhancements are enabled to run on the remote system and the workstation access list (WAL) does not allow access to NQS services.

See Section 16.9, page 229, for more information about troubleshooting validation files.

Another possible reason that your request is not executing is that when NQS reads your `.cshrc` file or your request script file, it may encounter commands it cannot invoke and cause your request not to run. You will see these problems reflected in your standard error file. Also, NQS sets an environment variable called `ENVIRONMENT` to value `BATCH` for each NQS initiated job. This variable can be checked within a `.profile`, `.login`, or `.cshrc` script and be used to differentiate between interactive and batch sessions; this action can be used to avoid performing terminal setup operations for a batch job. A benefit of NQS initiating the batch job as a login shell is that `.profile`, `.login`, or `.cshrc` scripts are run and your environment is set up as expected.

If the UNICOS multilevel security (MLS) feature or the UNICOS/mk security enhancements are enabled on the remote system, you cannot submit a request to a remote host if the remote host has a workstation access list (WAL) entry for the host of origin that restricts your access to NQS services.

If the UNICOS MLS feature or the UNICOS/mk security enhancements are enabled on your system, the request is deleted if a requested execution label is not within the authorized range, and you may receive the following mail message:

```
System security violation.
Request deleted.
```

```
Bad session security attributes.
```

16.4 Connection Failure Messages

If you are using a client command to talk directly to an NQS server and a network error condition exists that can be retried, you will receive messages such as the following:

```
Retrying connection to NQS_SERVER on host ice (147.111.21.90) . . .
QUESRV: ERROR: Failed to connect to NQS_SERVER at ice [port 607]
NETWORK: ERROR: NQS network daemon not responding
```

The server may have just come up, it may not be listening, or the network may be busy. The client will retry the connection to the server for 30 seconds. You also can verify that the value of the `NQS_SERVER` environment variable is set to a host running NQS.

If you are using a client command or the NQE GUI to connect to the NQE database, and the database server is not up or does not exist, you will see a message such as the following:

```
Connect: Connection refused
NETWORK: ERROR: NQE Database connection failure:
        Can't connect to MSQL server on Latte
```

16.5 Authorization Failure Messages

The default validation type in NQS is file validation. File validation requires a `.rhosts` or `.nqshosts` file in the login directory of your account on all of the NQE node systems where your request may run. This applies even if your target NQS server is your local machine.

For information about validation files, see Section 2.3, page 24.

If you encounter authorization failure messages, consider these alternatives:

- A `.rhosts` or `.nqshosts` file may not exist for the user name under which the request will be run. This may be the case if the `$HOME` environment variable points to a location that does not have these files.
- The proper *hostname-username* pair is not contained in a validation file. You must have an entry in a validation file for every NQE node that the Network Load Balancer (NLB) or the NQE database may select to run your request.

- A password is required and was not supplied, or the wrong password was supplied.
- Depending on your local network configuration, host names of nodes might have to be fully qualified (that is, you may have to include `ice.site.com` rather than simply `ice`).
- You may have created both `.rhosts` and `.nqshosts` files, and only the `.rhosts` file is correct. When the `.nqshosts` file exists, NQS ignores the `.rhosts` file.

16.6 NQE Database Authorization Failures

A client trying to connect to the database without the proper validation will result in an error such as the following:

```
latte$ cqstatl
NETWORK: ERROR: NQE Database connection failure:
         Connection disallowed.
latte$
```

To determine why you cannot connect, check with your database administrator.

16.7 Requests Disappear

If it appears that your request has disappeared, the following procedures may reveal its location (if these do not uncover the request, consult with your NQE administrator):

- Enter either the `cqstatl -a` or the `qstat -a` command to display all of your requests on the local machine; this display may reveal the location of your request.
- If you think that your request may have been sent to a remote system for execution, enter either the `cqstatl -a -h` *hostname* or the `qstat -a -h` *hostname* command to display all of your requests at the remote system.
- Check to see whether you have received a mail message about the problem; this message may help you to determine the cause of the problem.
- In the NQE GUI, display all of your requests in NQS batch queues in the cluster by using the left mouse button to click on the `Status` button. For information about interpreting this display, see Section 10.1, page 137.

- Check to see whether the request has completed. Look for the standard output and standard error files that the request produced. Unless you specified a different location for these files, they should be in the directory from which you submitted your request. If they are not there, check your home directory on the NQS server at which your request executed.

  If you used an alternative user name, try the home directory of the user name you used to submit the request.

  If the request was executed at a remote system, try checking the remote system in the home directory of the user under whom the request was executed.

16.8 NQE Scheduler Not Scheduling

If the NQE scheduler is not scheduling the request, an NQS server may not be available to accept your request.

16.9 `-h` Option Displays Error

You may receive the following error message when you issue a `cqstatl`, `cqdel`, `qdel`, or `qstat` command with the `-h` option to specify the host name of an NQS server, or you may receive the message if you use the NQE GUI and try to delete or signal a request to a specified host.

When using the `cqstatl` or `qstat` command, the following message may be displayed:

```
No account authorization at transaction peer.
```

When using the `cqdel` or `qdel` command or the NQE GUI, the following message may be displayed:

```
No account authorization on target host
```

When you encounter the preceding message, consider these alternatives:

- A `.rhosts` or (`.nqshosts`) file may not exist for this user. This may be the case if the `$HOME` environment variable points to a location that does not have these files.
- The proper *hostname-username* pair is not contained in either of these files. NQS checks the `.rhosts` file only when the `.nqshosts` file does not exist.

- A password is required and was not supplied, or the wrong password was supplied.

For further information, see Chapter 2, page 21.

16.10 Resource Limits Exceeded

If your request exceeds resource limits, errors or unexpected results can occur. If an error occurs, your request proceeds with the next command. You then should examine the return values from commands and calls executed within a request to check whether an error has occurred.

Within a request file, you can verify the exit status of the last command executed by examining one of the following:

- The `?` variable for requests that use `sh` or `ksh`
- The `status` variable for requests that use `csh` or `tcsh`

You also can look at the job log for exit status information.

Some limits violations can terminate your program, which may result in the generation of a core file. If your job does not complete successfully and there are no other errors indicated, you should look for a core file in the directories in which your job was executing.

16.11 Output Files Cannot Be Found

Unless you specified a different location for the standard output, standard error, and job log files, they should be in the directory you were working in when you submitted your request.

The first thing you should do is check your electronic mail. If NQS has tried to write your output to another directory, it sends you mail. For examples of mail messages, see Section 4.11, page 69.

The most likely locations for your output are as follows:

- Your home directory on the executing NQS server

  Note: For NQE database requests, the NQE database will send your output files to your home directory on your NQE client.

- If you used the NQE GUI, or the `cqsub -u` or `qsub -u` command, the home directory of the user name you specified

- The NQS `failed` directory
- The NQE GUI has some other output default settings that you should check, such as the job output directory.

NQS uses the following methods, in the order listed, to return your output to you:

1. NQS tries to send it by using NQS protocol. This method works if you submitted the request from an NQS server.
2. NQS tries to use `fta`. This method works if you have a `.netrc` file containing a password on the execution node or if FTA has been configured between client and node to use NPPA (no passwords).
3. NQS tries to use `rcp`. This method works if you have a `.rhosts` entry on your submitting system, and your `.rhosts` file has an entry for the NQE node that executed your request. Depending on your local network configuration, host names of nodes might have to be fully qualified (that is, you may have to include `ice.site.com` rather than simply `ice`).
4. NQS sends you mail stating that it could not deliver your output to its first destination. It places your output in your home directory on the NQS execution server.
5. NQS delivers your output to an administrative directory. To retrieve the files, you must contact your system administrator.

When using DCE/DFS, note the following:

- After a request completes, NQS uses `kdestroy` to destroy any credentials obtained by NQS on behalf of the request's owner.

Caution: On UNICOS systems, do not put a `kdestroy` within a request's job script; it will destroy the credentials obtained by NQS and prevent NQS from returning request output files into DFS space.

- On UNIX platforms, there is not an integrated login system feature available. NQS on UNIX platforms obtains separate DCE credentials for request output return. Therefore, a `kdestroy` placed within a request's job script running on an NQE UNIX server will not affect the return of request output files into DFS space.

If the UNICOS MLS feature or the UNICOS/mk security enhancements are enabled on your system, the job output files are labeled with the job execution label. For jobs that are submitted locally, the return of the job output files may fail if the job submission directory label does not match the job execution label.

For example, if a job is submitted from a level 0 directory, and the job is executed at a requested level 2, the job output files cannot be written to the level 0 directory. If the home directory of the UNICOS user under whom the job ran is not a level 2 directory, does not have a wildcard label, or is not a multilevel directory, the job output files cannot be returned to that directory either. The job output files will be stored in the NQS failed directory.

If the UNICOS MLS feature or the UNICOS/mk security enhancements are enabled on your system and you submitted a job remotely, the Internet Protocol Security Options (IPSO) type and label range, which is defined in the network access list (NAL) entry for the remote host, affects the job output file return. The following example shows a successful return of the job output files to a wildcard-labeled home directory on the execution host:

```
Message concerning NQS request: 1262.cool ended.
Request name:   STDIN
Request owner: snow
Mail sent at:   10:24:04 CST
Request exited normally.

_Exit() value was: 0.

  Stdout file staging event status:
  Destination: -o cool:/home/usr/snow/STDIN.o1262
    Output file could not be returned to primary destination.
    Output file successfully returned to backup destination
    in user home directory on the execution machine.

    Transaction failure reason at primary destination:
    File access denied at transaction peer.

  Stderr file staging event status:
  Destination: -e coal:/home/usr/snow/STDIN.e1262
    Output file could not be returned to primary destination.
    Output file successfully returned to backup destination
    in user home directory on the execution machine.

    Transaction failure reason at primary destination:
    File access denied at transaction peer.
```

For more information on locating output files, see Section 6.4, page 110.

16.12 `stdout` Reports `no access to tty`

The following message is always displayed at the start of the standard output file for batch requests that have executed under the C shell:

```
Warning: no access to tty; thus no job control in this shell...
```

This message does not indicate that an error has occurred. It is simply a warning that the usual C shell job control options are not available because this is a batch request.

Job control is a means of controlling multiple shells or processes interactively. It is not available with a batch request because no interactive session (referred to as `tty` in the message) is associated with the job.

16.13 `stderr` Reports Many Syntax Errors

If the standard error file contains an excessive number of syntax errors, you may be using the wrong shell.

For information on selecting a shell, see Section 5.3, page 94. Usually, it is shell flow control commands (such as `if`, `while`, `for`, and `foreach`) that cause errors when the wrong shell is used.

16.14 `stderr` Reports `file not found`

When a request begins execution, NQS assumes that any files you are trying to access are in your home directory (or the initial working directory you are in when you log in interactively).

To indicate that a file is somewhere else, do one of the following:

- Use the full path name
- Move to the correct directory by using the `cd` command in your request before you try to access the file

16.15 No Licenses Are Available

When you try to submit a request and no NQE licenses are available, your request is accepted, but it will be held in a wait state in NQS. You will see the following status messages:

```
Wlm
WAITING
License Unavailable
```

NQE tries to obtain a license every 3 minutes.

16.16 DCE/DFS Credentials Not Obtained

Failure to obtain DCE credentials results in a nonfatal error. The request will be initiated even if the attempt to obtain DCE credentials for the request owner fails. If DCE credentials are successfully obtained, the `KRB5CCNAME` environment variable is set within the request process that is initiated.

A restarted job correctly gets the new credentials obtained from NQS, but the `KRB5CCNAME` environment variable within the restart file is not reset to the new cache file name. After the job is restarted, a `klist` within the job script will incorrectly state that there are no credentials. As a result, DCE services are affected but not DFS, which continues to work with the new credentials.

Man Page List [A]

The `man` command provides online help on all NQE commands. To view a man page online, type `man` *commandname.* You must ensure that your `MANPATH` is set properly, as described in Section 2.2, page 22.

Your NQE software includes the following user-level online man pages:

User-level man page	Description
`cevent`(1)	Posts, reads, and deletes job-dependency event information
`cqdel`(1)	Deletes or signals to a specified batch request
`cqstatl`(1)	Provides a line-mode display of requests and queues on a specified host
`cqsub`(1)	Submits a batch request to NQE
`ftua`(1)	Transfers a file interactively (this command is issued only on an NQE node that has had the NQE components installed on it)
`ilb`(1)	Executes a load-balanced interactive command
`nqe`(1)	Provides a graphical user interface (GUI) to NQE functionality
`qalter`(1)	Alters the attributes of one or more NQS requests (this command is issued only on an NQE node that has had the NQE components installed on it)
`qchkpnt`(1)	Checkpoints an NQS request on a UNICOS, UNICOS/mk, or IRIX system (this command is issued only on an NQE node that has had the NQE components installed on it)
`qdel`(1)	Deletes or signals NQS requests (this command is issued only on an NQE node that has had the NQE components installed on it)

`qlimit`(1)	Displays NQS batch limits for the local host; this command also displays the `qsub` command options that are used to specify each resource at the time of submission (this command is issued only on an NQE node that has had the NQE components installed on it)
`qmsg`(1)	Writes messages to `stderr`, `stdout`, or the job log file of an NQS batch request (this command is issued only on an NQE node that has had the NQE components installed on it)
`qping`(1)	Determines whether the local NQS daemon is running and responding to requests (this command is issued only on an NQE node that has had the NQE components installed on it)
`qstat`(1)	Displays the status of NQS queues, requests, and queue complexes (this command is issued only on an NQE node that has had the NQE components installed on it)
`qsub`(1)	Submits a batch request to NQS (this command is issued only on an NQE node that has had the NQE components installed on it)
`rft`(1)	Transfers a file in a batch request (this command is issued only on an NQE node that has had the NQE components installed on it)

Command Line Interface Tutorial [B]

This tutorial introduces you to the NQS commands that are used to submit, monitor, and control an NQS batch request. Before using this tutorial, read through Chapter 1, page 1.

The tutorial covers the following basic tasks:

- Creating a batch request
- Submitting a batch request for execution, including finding the standard output and standard error files produced by the batch request
- Monitoring the status of your submitted requests
- Deleting a submitted batch request

You can find a complete description of the tasks you can perform in the other chapters of this publication.

You may find it helpful to read this tutorial at your workstation because it contains several exercises that you can perform. For a list of the commands and options in the order in which they appear in this tutorial, see Section B.6, page 266.

Before you can submit batch requests, you must ensure that you have a valid user name and password to enable you to log in to the operating system.

Note: The exercises in this tutorial create several files in your current directory. You can create a new directory from which to perform the exercises to make it easier to remove the unwanted files at the end of the tutorial. A list of the files created is given at the end of the tutorial in Section B.5, page 265.

B.1 Creating the Batch Request

Before you can submit a batch request, you must first create a script file that contains the commands that make up the request. You can create this file by using any text editor (such as `vi`(1)).

A batch request can be one command, such as the following example:

```
who           # list users of the CRI system
```

Usually, however, it contains several commands. For example, the following batch request compiles and runs a CF90 Fortran program:

```
set -x             # Echo commands into standard output
ja                 # Enable job accounting
date               # Print current date and time
f90 loop.f         # Compile a program called loop.f
segldr loop.o      # Load replaceable loop.o as  a.out
date               # Print date and time
./a.out            # Execute the program a.out
date               # Print date and time
rm loop.o a.out    # Remove files
echo job complete
ja -csft           # Report job accounting information
                   # and disable job accounting
```

If you enter the required commands interactively, line-by-line, from standard input (`stdin`), you do not have to create a file. This is done by issuing a `cqsub` or `qsub` command without a batch request file name.

```
% qsub
ls
who
CONTROL-d
nqs-181 qsub: INFO
  Request <365.coal>: Submitted to queue <express> by <snow(123)>.
%
```

When this form of `cqsub` or `qsub` is used, the request is given the name `STDIN`, which is used to form the names of the standard output and standard error files produced by the request. See Section B.2.5, page 245.

However, if you make an error halfway through entering a request and do not find the error until after you have started the next line, you cannot return and correct the error. You must press `INTERRUPT` (usually `CONTROL-c`) to terminate the `cqsub` or `qsub` command and start again.

B.1.1 Exercise 1

Log on interactively to your system and create a file called `testjob` that contains the following lines:

```
date
pwd
ls
```

Save this file, because it is used in exercises later in this tutorial. (The commands in this file simply display the current date and time, display the path to the current directory, and list the contents of the current directory.)

The shell used to execute NQS batch requests may not be the same as your login shell; therefore, the results of batch request execution may differ from interactive execution of the commands in the request file. See Section B.2.1, page 241.

B.2 Submitting a Batch Request for Execution

To submit a batch request for execution, use the `cqsub` or `qsub` command, which has many options. For a complete list of the options, see the `cqsub`(1) or `qsub`(1) man page. A simplified form of the `cqsub` and `qsub` commands are as follows:

`cqsub [-q` *queue*`]` *file*

`qsub [-q` *queue*`]` *file*

The *file* argument is the name of the script file that will be submitted for execution.

The `-q` *queue* option indicates the name of an NQS queue to which the request will be initially sent (it does not apply to requests sent to the NQE database). The NQS administrator may define several NQS queues that are available to users; the definition includes a list of one or more destination queues to be associated with each NQS queue. Usually, you would submit a request to a pipe queue, which would then route your request to a suitable batch queue for execution (although some systems may let you submit a request directly to a batch queue). To display a list of the NQS queues, you can use the `cqstatl`(1) or `qstat`(1) command.

To submit a file called `testjob` to an NQS queue called `std`, you can use the following command line:

```
% qsub -q std testjob
```

You will receive one of the following messages:

```
nqs-181 qsub: INFO
  Request <366.coal>: Submitted to queue <std> by <snow(123)>.

nqs_4517 qsub: CAUTION
  No such queue <std> at local host.
```

If you omit the `-q` option, the batch request is sent to the default NQS batch request queue (if one has been defined).

In the following example, the default queue is called `express`:

```
% qsub testjob
nqs-181 qsub: INFO
  Request <367.coal>: Submitted to queue <express> by <snow(123)>.
%
```

You can specify the default queue in the `QSUB_QUEUE` environment variable. If you have not defined that variable, the request is sent to a system default queue (if the NQS administrator has defined such a queue). In some configurations, the administrator may not have defined any system default queue; therefore, you must specify a queue by using the `-q` option.

You can display the name of the system default queue as defined by the NQS administrator only by using the `qmgr`(8) command. Many of the `qmgr` subcommands can be executed only by the NQS administrator, but any user can use the `show parameters` subcommand to display the default batch request queue.

In the following example, which is a partial display, the default batch request queue has the name `batch`.

```
% qmgr
Qmgr: show parameters
show parameters

  Checkpoint directory = /usr/spool/nqs/private/root/chkpnt
  Debug level = 0
  Default batch_request queue = batch
  Default destination_retry time = 72 hours
  Default destination_retry wait = 5 minutes
  Default return of a request's job log is OFF
  Global batch group run-limit: 40
  Global batch run-limit:      1
  Global batch user run-limit: 40
  Global MPP Barrier limit:    unspecified
  Global MPP Processor Element limit:    unspecified
  Global memory limit:         unlimited
  Global pipe limit:          20
  Global quick-file limit:     543227904w
  Global tape-drive a limit:   unlimited
  Global tape-drive b limit:   16
  Global tape-drive c limit:   16
  Global tape-drive d limit:   16
  Global tape-drive e limit:   16
  Global tape-drive f limit:   16
  Global tape-drive g limit:   16
  Global tape-drive h limit:   16
Press  to continue.
```

B.2.1 Discovering the Shell to Be Used for Your Requests

The shell used to execute your NQS batch requests may not be the same as your login shell. When you submit a batch request to NQS, you can specify the shell to be used for that request by using the `cqsub -s` or `qsub -s` command. You can specify the `csh`, `ksh`, or `sh` shell names. The `-s` option overrides any shell strategy that is configured on the execution machine. When NQS initiates the request, it spawns a second shell. If your login shell is `sh` or `ksh`, the request is run under that shell. If your login shell is `csh` and the request will run under `csh`, you must include the `#!/bin/csh` command as the first line of the shell script itself (before any `#QSUB` directives). If you do not use this command, NQS will run the batch request under `sh`. This is normal `csh` behavior, and it is described in the `csh`(1) man page.

To ensure that a batch request always uses a certain shell, embed the following command line in the script file:

`#QSUB -s` *shell_name*

The *shell_name* argument is the full path name of the shell you want to use to interpret the batch request shell script.

For a description of the passing of environment variables to a batch request, see Section 9.1, page 127. You also can set individual shell variables within a batch request.

B.2.2 Exercise 2

This exercise uses a script file called `testjob` that contains the following lines:

```
date
pwd
ls
```

Before proceeding with the exercise, you should check that this file exists and has the preceding contents.

Next, find the name of an NQS pipe queue to which you can submit a request by issuing the `cqstatl` or `qstat` command with the `-p` option, as shown in the following example (this option does not apply if you are sending the request to the NQE database). The pipe queue names are listed under the column `QUEUE NAME`.

```
% qstat -p
----------------------
NQS PIPE QUEUE SUMMARY
----------------------
QUEUE NAME              LIM TOT ENA STS QUE ROU  WAI HLD ARR DEP  DESTINATIONS
----------------------- --- --- --- --- --- ---  --- --- --- ---  -------------
express                   2   1 yes  on   0   1    0   0   0   0 b_600_96
                                                                  b_1800_96
                                                                  b_3600_96
                                                                  b_14400_96
                                                                  b_86400_96
                                                                  b_max_96
big                       1   0 yes  on   0   0    0   0   0   0  b_large
cray02                    1   0 yes  off  0   0    0   0   0   0  batch@cray02
cray03                    1   0 yes  off  0   0    0   0   0   0  batch@cray03
----------------------- --- --- --- --- --- ---  --- --- --- ---  -------------
coal                      5   1           0   1    0   0   0   0
----------------------- --- --- --- --- --- ---  --- --- --- ---  -------------
```

The display produced by this command shows all of the NQS pipe queues that are available and the destinations of each queue. If the display is so big that part of it scrolls off the screen, you can use the `more`(1) command to page the display, as follows:

```
qstat -p | more
```

If you are unsure which queue to use for your requests, ask your system administrator. Whichever queue you choose to use, check that the entry in the `ENA` column is `yes` and that the entry in the `STS` column is `on`. If you see some other value for the queue, ask your administrator to enable and start the queue.

To define the queue name you want to use as your default queue, set the `QSUB_QUEUE` environment variable, depending on the type of login shell that you are currently using, as follows.

For C shell users:

```
setenv QSUB_QUEUE queue-name
```

For standard or Korn shell users:

```
QSUB_QUEUE=queue-name
export QSUB_QUEUE
```

The following example shows how to set the default queue to `big` when you are using the C shell:

```
% setenv QSUB_QUEUE big
%
```

Now send a batch request for the script file you created in exercise 1 without specifying a queue name so that it is sent to the default queue.

```
% qsub testjob
nqs-181 qsub: INFO
  Request <368.coal>: Submitted to queue <big> by <snow(123)>.
%
```

To unset an environment variable, you can use the `unsetenv` command (see `setenv`(3)) if you are using the C shell, or the `unset` command if you are using the standard or Korn shell.

B.2.3 Confirmation of a Successful Submission

If your batch request is submitted successfully, you will receive a message that displays an identifier for the request. You can use this identifier in other commands, for example, to monitor the progress of the request or to delete the request. The message also contains the name of the queue in which the request was initially placed.

For example, when you complete the preceding exercise, you should get an NQS message similar to the following:

```
nqs-181 qsub: INFO
  Request <368.coal>: Submitted to queue <express> by <snow(123)>.
```

The identifier for this request is `368.coal`, which indicates that the request has a sequence number of `368` and was submitted to an NQS server with host name `coal`. In this example, the request is initially sent by user `snow` to a queue called `express`.

To display the current status of your submitted requests, use the `cqstatl -a` or `qstat -a` command. For more details about the `cqstatl` or `qstat` command, see the `cqstatl`(1) or `qstat`(1) man page.

B.2.4 Exercise 3

Record the request identifier displayed when you performed exercise 2 (for use in subsequent exercises). Check that the displayed queue is the same as the default queue you set in the `QSUB_QUEUE` environment variable.

B.2.5 Examining Output from a Batch Request

After a batch request is executed, the standard output, standard error, and job log files produced by the request are written. The *standard output file* contains the messages that would have been displayed if you had issued the commands contained in the batch request in an interactive session. The *standard error file* contains any error messages that are produced during the execution of the script. The *job log file* contains explanatory messages for request-related events.

By default, these files are written to the directory you were in when you issued the `cqsub` or `qsub` command and are given the following names:

Name	Description
`testjob.e` *number*	The standard error file produced by the batch request
`testjob.o` *number*	The standard output file produced by the batch request
`testjob.l` *number*	The job log file produced by the batch request

The *number* argument is the sequence number as displayed when you submitted the request. If you submit requests that have file names greater than 7 characters, only the first 7 characters are used in forming the output file names.

To merge the messages that would be sent to the standard error file into the standard output file, use the `qsub -eo` or `qsub -eo` command.

The command lines that are executed are not written to the standard output or error files unless you include an appropriate UNIX `set` command at the start of the batch request (see Section B.2.7, page 247).

B.2.6 Exercise 4

If you submitted the batch request as detailed in exercise 2, after a short time (the exact time depends on the amount of other work being done on the system, but it could be just a few seconds), the batch request completes

execution and the following files are placed in the directory that you were in when you issued the `cqsub` or `qsub` command:

`testjob.e`*number*
`testjob.o`*number*
`testjob.l`*number*

Check your current directory for these files, and check that *number* is the same as the sequence number displayed when you first submitted the batch request.

Examine the contents of the standard output file (`testjob.o` *number*) by using a command such as `more`(1). The file should contain output similar to that shown in the following screen:

```
% more testjob.o368

             Cray Research, Inc. CRAY C90 UNICOS - abc

                          UNICOS 9.0.10bm
                       CRAY C9016E/16256-4
                             1gw SSD
                             Model-E
                       4.167 nanosecond clock
               16 - cpus 256 megawords of real memory
             and a Kernel with 32 bit full memory address

Tue Jan 6 05:07:47 CST 1998
/sub/snow
fred
anoldfile
temp1
testjob
%
```

The `pwd` and `ls` commands indicate that the request executed with your home directory as its current directory, even if you submitted the request from a directory other than your home directory.

The UNIX command lines that the batch request executed are not echoed to the standard output file.

B.2.7 Exercise 5

This exercise uses a script file called `testjob` that contains the following lines:

```
date
pwd
ls
```

Before proceeding with the exercise, you should check that this file exists and has the preceding contents.

To echo the command lines in the script to the standard error file as they are executed, edit the `testjob` file so that it includes one of the following lines at the start (depending on the shell under which the script will execute).

To discover which shell your requests will use, see Section B.2.1, page 241.

For the C shell:

```
set echo
```

For the standard or Korn shell:

```
set -x
```

Save the changes and then resubmit the request by using the `-eo` option as follows, specifying that any standard error messages produced by the request will be placed in the standard output file:

```
% qsub -eo testjob
nqs-181 qsub: INFO
  Request <369.coal>: Submitted to queue <express> by <snow(123)>.
%
```

When the request executes, a new standard output file is created in your current directory; its file name includes the sequence number for this request. No separate standard error file is created because the `-eo` option was used. Because of the `set` command you included in the script file, the output file contains the actual UNIX commands executed, intermingled with the output.

Examine the contents of the standard output file (`testjob.o` *number*) by using a command such as `more`(1). The file should contain output similar to that shown in the following screen:

```
% more testjob.o369

Warning: no access to tty; thus no job control in this shell...
             Cray Research, Inc. CRAY C90 UNICOS - abc

                            UNICOS 9.0.10bm
                         CRAY C9016E/16256-4
                               1gw SSD
                               Model-E
                         4.167 nanosecond clock
                  16 - cpus 256 megawords of real memory
               and a Kernel with 32 bit full memory address

+ date
Tue Jan 6 05:28:14 CST 1998
+ pwd
/sub/snow
+ ls
fred
anoldfile
temp1
testjob
%
```

When a request has executed under the C shell, NQS always displays the message that begins `Warning:no access to tty;` at the start of the standard output file. The message does not indicate that an error has occurred; it is simply a warning that the usual C shell job control options are not available because this is a batch request. *job control* is a means of controlling multiple shells or processes interactively, and is not available with a batch job because no interactive session (referred to as `tty` in the message) is associated with the job.

B.2.8 Specifying Resource Limitations for a Batch Request

When you submit a batch request to NQS, you can include options to specify the system resources that the request requires. If you do not specify any options, resource restrictions are assigned based on the user database (UDB) limits and the limits set by the system administrator for the batch queue in which the request executes.

You can specify many different limits to `cqsub` and `qsub` (see Section 5.1, page 86, for a complete list of limits). Some of the more common options are as follows:

Option	Description
`-a` *date*	The earliest time at which the request can be executed.
`-lT` *time*	The maximum number of CPU seconds the job can use when executing at the UNICOS system.
`-lM` *size*	The maximum amount of memory the request is allowed to use when it executes. The size is in units of bytes unless it is suffixed by some other unit (such as Kb or Mb); see the `cqsub`(1) or `qsub`(1) man page.

You can specify these options on the `cqsub` or `qsub` command line.

The following command submits a batch request called `testjob` that has the following characteristics:

- The request is sent to the default NQS queue
- The request cannot be executed before 11 P.M. on the first Friday following the day of submission
- The request requires a maximum of 5 CPU seconds at the UNICOS system

```
qsub -a "23:00 Friday" -lT 5 testjob
```

The batch request file name is always the last item on the `cqsub` or `qsub` command line following any options.

Note: When specifying resource limits, be careful not to specify more resources than the request will use, because these limits are used to schedule work. Requests that have large resource limits (for example, a large CPU time or memory) are generally executed less often than those with smaller resource limits. Therefore, the larger the limits you specify, the longer it may take to complete your work.

After a request has been submitted, you cannot change the resource limits specified for the request. However, the system administrator can change the limits by using the `qmgr`(8) command.

B.2.9 Exercise 6

This exercise uses a script file called `testjob` that contains the following lines:

```
set -x (standard or Korn shell only)
set echo (C shell only)
date
pwd
ls
```

Before proceeding with the exercise, you should check that this file exists and has the preceding contents.

Submit a batch request specifying that it will be executed 2 minutes later than the current time.

If it is now 9:45 A.M., you can enter the following command:

```
% qsub -a "9:47" testjob
nqs-181 qsub: INFO
  Request <370.coal>: Submitted to queue <express> by <snow(123)>.
%
```

The `-a` option can take several different formats of date and/or time. For this exercise, the format for the time used is *hours*`:`*minutes* (using a 24-hour clock).

If you do not specify a specific day, the request executes the next time the specified time occurs (that is, today if the specified time is later than the time the command was issued, or tomorrow if the specified time is earlier than the time the command was issued).

The `-a` option does not delay the entering of a request into the initial queue, or its routing through to the destination batch queue. This routing occurs as normal. However, after the request reaches the final destination queue, it waits in that queue until the time and date specified by the `-a` option.

You should not see in your current directory any of the output files produced by this request for at least 2 minutes.

To display the status of the request, use the `cqstatl -a` or `qstat -a` command; the letter `W` in the column headed `ST` indicates that the request is waiting until the time specified by the `-a` option, as follows:

```
sn1633% qstat -a
--------------------------
NQS BATCH REQUEST SUMMARY
--------------------------
IDENTIFIER    NAME    USER     QUEUE                JID  PRTY REQMEM REQTIM ST
------------ ------- -------- -------------------- ---- ---- ------ ------ ---
370.coal      testjob snow     express@coal              ---  5120       10 W
no pipe queue entries
no device queue entries
sn1633%
```

NQS can notify you when a request starts execution and stops execution by using the `cqsub` or `qsub` command options `-mb` and `-me`. See Section 4.11, page 69.

B.2.10 Specifying Options within the Script File

An alternative method of specifying `cqsub` or `qsub` options is to supply them at the start of the batch request file. The options must come before the first executable line of the script (that is, before any lines that are not comments). Each `cqsub` or `qsub` option must be on a separate line and each line must be prefixed by the string `#QSUB`.

The following modified version of the shell script `testjob` specifies identical executing conditions to those in the `cqsub` or `qsub` line shown in Section B.2.8, page 248:

```
#QSUB -a "23:00 Friday"
#QSUB -lT 5
date
pwd
ls
```

If you specify an option both in the script file and on the `cqsub` or `qsub` command line, the option on the command line is used. It is useful to specify in the script file the conditions that do not change (such as the CPU time limit for the request), and to specify on the `cqsub` or `qsub` command line the options that may change with every submission of the script file (such as the time at which the request will be executed).

B.2.11 Exercise 7

This exercise uses a script file called `testjob` that contains the following lines:

```
set -x (standard or Korn shell only)
set echo (C shell only)
date
pwd
ls
```

Before proceeding with the exercise, you should check that this file exists and has the preceding contents.

Submit a batch request that will not be executed until 3 minutes later than the current time, but specify this time limitation within the script file. To do this, edit the script file and include an appropriate `#QSUB` line.

If it is now 11:59 A.M., you would edit the script file to include the following line as the first line in the file:

```
#QSUB -a "12:02"
```

To display the status of the request, use the `cqstatl -a` or `qstat -a` command; the letter `W` in the column headed `ST` indicates that the request is waiting until the time specified by the `-a` option, as follows:

```
sn1633% qstat -a
------------------------------
NQS 3.1 BATCH REQUEST SUMMARY
------------------------------
IDENTIFIER    NAME    USER     QUEUE                JID  PRTY REQMEM REQTIM ST
------------ ------- -------- -------------------- ---- ---- ------ ------ ---
370.coal      testjob snow     express@coal              ---  5120       10 W
no pipe queue entries
no device queue entries
sn1633%
```

NQS can notify you when a request starts execution and stops execution by using the `cqsub` or `qsub` command options `-mb` and `-me`. See Section 4.11, page 69.

B.2.12 Sending a Message to an Executing Request

Occasionally, you may want to write a message to the output files produced by a request. For example, you may want to send a message that mentions that you are about to abort the request.

To write a message to a request's output files, use the `qmsg`(1) command. The request must be executing for the command to succeed because the output files are not created until the request begins to execute.

Using options to `qmsg`, you can specify whether the message is written to the standard output file or to the standard error file produced by the request.

```
% qsub sleeper
nqs-181 qsub: INFO
Request <1109.coal>: Submitted to queue <express> by <snow(123)>.
% qmsg 1109.coal
Hello request 1109.
I am about to abort you.
CONTROL-d
%
```

After entering the `qmsg` command line, you can enter lines of text, terminating each line by pressing `RETURN`. When you have entered all the lines, press `CONTROL-d`.

The message is written to the standard error file of the request, unless you use the `qmsg -o` command to write the message to the standard output file.

B.2.13 Exercise 8

Edit the `testjob` script to do the following:

- Remove the `#QSUB` line at the start of the script if you inserted this line in exercise 7
- Include the following line at the end of the script:

  ```
  sleep 120
  ```

  This line keeps the request executing for a couple of minutes to give you time to write a message to it.

The `testjob` script file should then contain the following lines:

`set -x` *(standard or Korn shell only)*
`set echo` *(C shell only)*
`date`
`pwd`
`ls`
`sleep 120`

Before proceeding with the exercise, you should check that the script has the preceding contents.

Submit the request by using the `cqsub` or `qsub` command. After a few seconds, try using the `qmsg` command to write a message to the request's standard error file.

```
% qsub testjob
nqs-181 qsub: INFO
  Request <1110.coal>: Submitted to queue <express> by <snow(123)>.
% qmsg 1110.coal
This is a test message from qmsg.
CONTROL-d
%
```

After you successfully enter the `qmsg` command, wait for about 2 minutes to allow the request to complete execution and then examine the standard error file of the request. This file should be returned in your current directory and have the name `testjob.e`*xxx*; *xxx* is the number of the request as displayed when you submitted it. The file should contain the message you sent with `qmsg` at the end of the file.

If you receive the following message when you enter the `qmsg` command, your request has not yet started to execute:

`Request's stderr file does not exist`

Wait a few seconds and try again.

If you get the following message when you enter the `qmsg` command, the request has completed execution and therefore, you cannot write to the request's output files:

`Request` *request-number* `does not exist`

Resubmit the request and, after a few seconds, try using the `qmsg` command.

B.2.14 Submitting a Request to a Remote Host

Sometimes you may want to execute a request at another system other than the one to which you are logged on. This can be done by submitting your request to a local pipe queue that has a queue at a remote system as its destination. For example, the screen shown in Section B.2.2, page 242, shows a local pipe queue called `cray02` that has the destination `batch@cray02`. This destination refers to a queue called `batch` at a remote system called `cray02`. For further information, see Section 4.1, page 51.

To execute requests at a remote NQS host, you may have to create some validation files, depending on how the NQS system has been configured. For more information, see Section 2.4, page 25. If you try to execute a request at a remote host, and you do not have the correct validation files, NQS sends a mail message to inform you of the problem.

When you enter the `cqstatl -p` or `qstat -p` command in Section B.3.5, page 260, you can display pipe queues on your local system that have remote destinations.

B.3 Monitoring NQS

The `cqstatl` or `qstat` command lets you monitor your batch requests and the status of the NQS queues. This section introduces you to the following commonly used options of `cqstatl` and `qstat`:

- Checking the status of your batch requests
- Checking the status of NQS pipe queues
- Checking the status of NQS batch queues

B.3.1 Checking the Status of Your Batch Requests

After your request has been submitted, you can check its status by using the `cqstatl` or `qstat` command. You can display information only about requests that you have submitted. You cannot display information about requests submitted by other users unless you are an NQE administrator.

To display a summary of all your requests (irrespective of which type of queue they are currently in), use the `qstat -a` or `qstat -a` command.

The following example shows a request in an NQS pipe queue:

```
% qstat -a
no batch queue entries
-------------------------
NQS PIPE REQUEST SUMMARY
-------------------------
IDENTIFIER    NAME    OWNER    USER     QUEUE                PRTY ST
------------- ------- -------- -------- -------------------- ---- ---
372.coal      testjob 1889     snow     express@coal         31   Q
no device queue entries
%
```

Unless the system is heavily loaded, your batch requests are transferred to a batch queue within a few seconds.

The following display shows the information displayed when your request is in an NQS batch queue:

```
% qstat -a
-------------------------
NQS BATCH REQUEST SUMMARY
-------------------------
IDENTIFIER    NAME    USER     QUEUE                JID  PRTY REQMEM REQTIM ST
------------- ------- -------- -------------------- ---- ---- ------ ------ ---
372.coal      testjob snow     standard@coal         155   30   1024     30 Qgr
no pipe queue entries
no device queue entries
%
```

One of the most important columns in these displays is the ST column, which gives a brief description of the current status of your request. The first letter displayed in this column can be one of the following:

Status	Description
A	Arriving.
C	Checkpointed. (Available only on UNICOS, UNICOS/mk, and IRIX systems.)
D	Departing.
E	Exiting.
H	Held.

`Q`	Queued. (The request has not yet begun execution because the limit for the maximum possible number of executing requests has been reached.)
`R`	Running.
`S`	Suspended.
`U`	Unknown state.
`W`	Waiting for the date/time specified by the `cqsub -a` or `qsub -a` command.

The other letters in the `ST` column provide more detailed information about the status of the request. For a full description of these additional characters, see the `cqstatl`(1) or `qstat`(1) man page.

B.3.2 Exercise 9

Edit the `testjob` script file to remove the last line (`sleep 120`). The file should then contain the following lines:

```
set -x (standard or Korn shell only)
set echo (C shell only)
date
pwd
ls
```

Before proceeding with the exercise, you should check that the script has the preceding contents.

Submit the `testjob` script and use the `cqstatl -a` or `qstat -a` command to check its status. Usually, a request remains in a pipe queue for only a short period of time.

To see the request in an NQS pipe queue, you must enter the `cqstatl` or `qstat` command immediately after the request is submitted, or you could include the `cqstatl` or `qstat` command on the `cqsub` or `qsub` command line, as follows:

```
% qsub testjob; qstat -a
nqs-181 qsub: INFO
  Request <373.coal>: Submitted to queue <express> by <snow(123)>.
no batch queue entries
-------------------------
NQS PIPE REQUEST SUMMARY
-------------------------
IDENTIFIER    NAME    OWNER    USER     QUEUE                PRTY ST
------------ ------- -------- -------- -------------------- ---- ---
373.coal      testjob 1889     snow     express@coal         31   Q
no device queue entries
%
```

After several (fewer than 10) seconds, try reissuing the `cqstatl` or `qstat` command to see whether the request has been transferred to a batch queue. If your system is lightly loaded, the request may have completed execution before you enter the `cqstatl` or `qstat` command line, and therefore, you see the following display:

```
% qstat -a
no batch queue entries
no pipe queue entries
%
```

If this occurs, you can ensure that the request stays in a batch queue long enough to monitor it by using the `cqsub -a` or `qsub -a` command to indicate the request should not be executed for another 10 minutes.

If the system you are using is very heavily loaded, you also may see the preceding display; the display would then indicate that the request had not yet been placed in any queue.

When the current time is 2:05 P.M., you could enter the following command:

```
% qsub -a "14:15" testjob
nqs-181 qsub: INFO
  Request <374.coal>: Submitted to queue <express> by <snow(123)>.
% qstat -a
--------------------------
NQS BATCH REQUEST SUMMARY
--------------------------
IDENTIFIER    NAME    USER     QUEUE                JID  PRTY REQMEM REQTIM ST
------------ ------- -------- -------------------- ---- ---- ------ ------ ---
374.coal      testjob snow     standard@coal         ---   30   1024     30 W
no pipe queue entries
no device queue entries
%
```

The W in the ST column indicates that the request is waiting until the time specified in the -a option.

B.3.3 Checking the Status of Queues

To display a summary of the status of all NQS queues, use the cqstatl or qstat command without arguments. (However, if you have the NQE_DEST_TYPE environment variable set to nqedb and you use the cqstatl command without options or arguments, the output is a summary of all your requests in the NQE database minus all terminated requests. For additional information about monitoring queues, see Chapter 11, page 155.) This display is often large, and you may want to limit the display to a particular type of queue by using one of the following cqstatl or qstat command options:

Option	Description
-b	A summary of all batch queues. (This option does not apply if you are sending the request to the NQE database.)
-p	A summary of all pipe queues. (This option does not apply if you are sending the request to the NQE database.)

B.3.4 Pipe Queues

To display summary information about pipe queues, use the cqstatl -p or qstat -p command (the -p option does not apply if you are sending a request to the NQE database). The following display shows that four NQS pipe queues are at the system called coal:

```
% qstat -p
----------------------
NQS PIPE QUEUE SUMMARY
----------------------
QUEUE NAME              LIM TOT ENA STS QUE ROU  WAI HLD ARR DEP  DESTINATIONS
----------------------- --- --- --- --- --- ---  --- --- --- ---  -------------
express                   2   1 yes  on   0   1    0   0   0   0 b_600_96
                                                                  b_1800_96
                                                                  b_3600_96
                                                                  b_14400_96
                                                                  b_86400_96
                                                                  b_max_96
big                       1   0 yes  on   0   0    0   0   0   0  b_large
cray02                    1   0 yes  off  0   0    0   0   0   0  batch@cray02
cray03                    1   0 yes  off  0   0    0   0   0   0  batch@cray03
----------------------- --- --- --- --- --- ---  --- --- --- ---  -------------
coal                      5   1           0   1    0   0   0   0
----------------------- --- --- --- --- --- ---  --- --- --- ---  -------------
```

All of the queues are enabled (shown in the `ENA` column), therefore, you can send requests to any of them. However, only the `express` and `big` queues are started (shown in the `STS` column); therefore, only these queues will route requests to a destination queue. The other two queues can accept requests, but they do not route them until the queues are started (the NQE administrator must do this).

In this example, one request is currently in queue `express`. This is being routed (shown in the `ROU` column) to one of the batch queues under the destination column; NQS decides which queue to use.

The destinations of the two queues, `cray02` and `cray03`, are pipe queues at other systems.

The final line of the display shows total figures for the system in which you are logged (the system is called `coal` in the preceding example).

B.3.5 Exercise 10

To see an entry for your request in the pipe queue summary display, submit the `testjob` batch request and try issuing the `cqstatl -p` or `qstat -p` command on the command line. Usually, a request remains in a pipe queue for only a short period of time. Therefore, if the system you are using is lightly loaded, you may have to include the `cqstatl` or `qstat` command on the same

command line as the `cqsub` or`qsub` command to catch the request before it is transferred to a batch queue.

```
% qsub testjob; qstat -p
nqs-181 qsub: INFO
  Request <375.coal>: Submitted to queue <express> by <snow(123)>.
-----------------------
NQS PIPE QUEUE SUMMARY
-----------------------
QUEUE NAME              LIM TOT ENA STS QUE ROU  WAI HLD ARR DEP  DESTINATIONS
----------------------- --- --- --- --- --- ---  --- --- --- ---  -------------
express                   2   1 yes  on   0   1    0   0   0   0 b_600_96
                                                                  b_1800_96
                                                                  b_3600_96
                                                                  b_14400_96
                                                                  b_86400_96
                                                                  b_max_96
big                       1   0 yes  on   0   0    0   0   0   0  b_large
cray02                    1   0 yes  off  0   0    0   0   0   0  batch@cray02
cray03                    1   0 yes  off  0   0    0   0   0   0  batch@cray03
----------------------- --- --- --- --- --- ---  --- --- --- ---  -------------
coal                      5   1           0   1    0   0   0   0
----------------------- --- --- --- --- --- ---  --- --- --- ---  -------------
%
```

Your request is displayed as an entry under the `ROU` column for the queue to which you submitted the request.

If the system you are using is heavily loaded, you may not see an entry in this display for your request because the request had not yet been placed in any queue.

B.3.6 Batch Queues

To display summary information about batch queues, use the `cqstatl -b` or `qstat -b` command (the `-b` option does not apply if you are sending a request to the NQE database). The following display contains information about the total NQS workload on the system:

```
% qstat -b
------------------------
NQS BATCH QUEUE SUMMARY
------------------------
QUEUE NAME              LIM TOT ENA STS QUE RUN  WAI HLD ARR EXI
----------------------- --- --- --- --- --- ---  --- --- --- ---
b_600_96                  2   2 yes  on   0   1    1   0   0   0
b_1800_96                 1   1 yes  on   1   0    0   0   0   0
b_3600_96                 1   0 yes  on   0   0    0   0   0   0
b_14400_96                1   1 yes  on   1   0    0   0   0   0
b_86400_96                1   1 yes  on   0   0    1   0   0   0
b_max_96                  1   0 yes  on   0   0    0   0   0   0

----------------------- --- --- --- --- --- ---  --- --- --- ---
coal                      5   5           2   1    2   0   0   0
----------------------- --- --- --- --- --- ---  --- --- --- ---
%
```

The batch queue summary display is useful if you want to check the status of one of your requests to see why it is taking so long to execute.

The final line of the display shows total figures for the system in which you are logged (the system is called `coal` in the preceding example).

In this display, some of the most important columns are those labeled `LIM`, `QUE`, `RUN`, and `WAI`; these columns are described as follows:

Column	Description
`LIM`	The maximum number of requests that can be executed concurrently in this queue. This limit is called the *queue run limit*.
`QUE`	The number of requests in the queue that are queued and ready to be executed. They have not yet begun execution because the limit for the maximum possible number of executing requests has been reached.
`RUN`	The number of requests in the queue that are currently executing.
`WAI`	The number of requests in the queue that are waiting to be executed at a specific time (as specified by the `cqsub -a` or `qsub -a` command).

The preceding example screen shows that for a batch queue called `b_600_96` one request is currently executing, and one request is waiting for a specific time

to execute (that is, it was submitted using the `-a` *time* option and the specified time has not yet occurred).

The batch queue summary display can give you an idea of the current batch work load on the system.

B.3.7 Exercise 11

To see the current status of the queues at the system you are using, use the `cqstatl -b` or `qstat -b` command, as in the following example:

```
qstat -b
```

To see whether your system is heavily loaded, look at the bottom line of the display and see how much greater the figure under `LIM` is than that under `RUN`. Look also to see the figures under the `WAI` and `QUE` columns (these indicate how many requests are queued but not yet executing).

B.4 Deleting a Batch Request

To delete batch requests that you have submitted, but no longer want to execute, use the `cqdel`(1) or `qdel`(1) command.

```
% qdel 317.coal
nqs-98 qdel: INFO
  Request <317.coal>: Deleted by <snow(123)>.
%
```

The preceding form of the `qdel` command deletes requests that have not started executing.

If a request has started executing, the following message is displayed when you issue a `cqdel` or `qdel` command without any options:

```
% qdel 317.coal
nqs-462 qdel: WARNING
  Request <317.coal>: is running on local host.
%
```

The request remains unaffected by the `qdel` command.

You can delete an executing request by sending it a *signal* with the `cqdel -k` or `qdel -k` command. You can send several signals to a request; one of the most common is the `SIGKILL` signal, which aborts a running process. Signals are associated with a number; the number for the `SIGKILL` signal is 9.

The number of the signal to send to a batch request is specified as an option in the `cqdel` or `qdel` command line. You can use the letter k as an alternative for signal number 9.

Standard output, standard error, and job log files are still produced for an executing request that is deleted by a signal. These files record the execution of the request up to the moment that the signal is received.

```
% qdel -k 380.coal
nqs-98 qdel: INFO
  Request <380.coal>: Deleted by <snow(123)>.
%
```

You can use `cqdel` or `qdel` to send signals to batch requests. You can write the request to trap the signal and then take some appropriate action, rather than to abort. For an example of a request that is written to trap a signal, see Section 13.1, page 177.

You can use the `qdel -f` command to delete both a request and the job output.

B.4.1 Exercise 12

To include the following line at the end of the script, edit the `testjob` script:

```
sleep 120
```

This keeps the request executing for a couple of minutes to give you time to delete it. The file should then contain the following lines:

```
set -x (standard or Korn shell only)
set echo (C shell only)
date
pwd
ls
sleep 120
```

Before proceeding with the exercise, you should check that the script has the preceding contents.

Submit the request, and try to delete it by using the `cqdel` or `qdel` command, as in the following example:

`qdel` *requestids*

If the request has already begun execution, you will receive the following message:

`Request` *requestids* `is running.`

In this case, reenter the `cqdel` or `qdel` command by using the `-k` option to send a `SIGKILL` signal to the request, as follows:

`qdel-k` *requestids*

If the request is still executing when you issue this command, you will receive a message, as follows:

`Request` *requestids* `has been deleted.`

To check that the request has been deleted, use the `cqstatl -a` or `qstat -a` command, as in the following example:

```
% qstat -a
no batch queue entries
no pipe queue entries
```

B.5 Removing Files from Your Directory after the Tutorial

The exercises in this tutorial will create several files in the directory from which you submitted the requests. You may want to remove the unwanted files from that directory. The following files were created:

File name	Description
`testjob`	One of the scripts used in the exercises
`testjob.o*`	Standard output files produced by the `testjob` script
`testjob.e*`	Standard error files produced by the `testjob` script

`testjob.l*`	Job log files produced by the `testjob` script

B.6 Summary

If you have completed this tutorial, you should be able to submit batch requests, to send a message to a request, to monitor the progress of your requests, and, if needed, to delete a batch request. The following list summarizes the commands and features that were introduced in this tutorial:

Command line — Description

`cqdel` *requestids* or `qdel` *requestids*

Deletes the specified request if it has not begun execution.

`cqdel -k` *requestids* or `qdel -k` *requestids*

Sends a kill signal to the specified batch request. This signal aborts the request if it is executing; otherwise, the request is deleted.

`qmsg`

Writes a message to the output file of an executing request.

`cqstatl -a` or `qstat -a`

Displays summary information about all of your requests that are currently residing in queues.

`cqstatl -b` or `qstat -b`

Displays a summary of NQS batch queues.

`cqstatl -p` or `qstat -p`

Displays a summary of NQS pipe queues.

`cqsub` or `qsub`

(This form of the `cqsub` or `qsub` command has no options or file names in the command line.) Lets you enter commands that are then submitted as a batch request. The batch request is sent to the default queue. The batch request is assigned a name of `STDIN`, which is used in the names of the standard output and standard error files produced by the request.

`cqsub` *batch-request-file* or `qsub` *batch-request-file*

Submits the name of the script file that will be submitted as a batch request into the default queue.

`cqsub -a` *date* `-lT` *time* `-lM` *size* or `qsub -a` *date* `-lT` *time* `-lM` *size*

These `cqsub` and `qsub` options specify resource limits for the request:

`-a` *date*	Earliest time at which the request can be executed
`-lT` *time*	Maximum CPU time for the request
`-lM` *size*	Maximum memory available to the request

`cqsub -q` *queue batch-request-file* or `qsub-q` *queue batch-request-file*

Submits the specified file into the specified NQS queue.

`#QSUB` *qsub-option*

Options to the `cqsub` or `qsub` command can be placed within a script file before any other commands.

`QSUB_QUEUE` *environment variable*

Sets the default queue for your session.

Other options to the commands are described in detail in the corresponding man pages.

Using FTP with NQS [C]

This appendix describes how to use the ARPAnet standard file transfer protocol (FTP) with the Network Queuing System (NQS) on UNICOS and UNICOS/mk systems. FTP is the file transfer program used by the Transmission Control Protocol/Internet Protocol (TCP/IP), which lets you transfer files to and from a remote network host.

By providing FTP access to NQS, computer systems that support FTP can access the NQS batch system on the UNICOS or UNICOS/mk operating system. The FTP interface to NQS lets you submit batch jobs to a UNICOS or UNICOS/mk system from any computer system that supports TCP/IP and lets you run batch jobs only on a UNICOS or UNICOS/mk system. You can run these batch jobs without logging in interactively to the UNICOS or UNICOS/mk system or running the Remote Queuing System (RQS) tool on your workstation. The FTP interface to NQS lets you display the status of batch mode, enable or disable batch mode, submit jobs to NQS, display a summary of the NQS job queues and a list of your NQS output files, delete NQS jobs, and retrieve NQS job output from a UNICOS or UNICOS/mk system. You can use the following FTP commands:

FTP command	Description
`del`	Deletes a job or output file
`dir`	Displays the job status
`get`	Retrieves the job output
`put`	Submits a job to NQS
`quote site batch` or `site batch`	Displays the current state of batch mode and enables or disables batch mode

To use the FTP interface to NQS, you must meet the following requirements:

- Your system must be running FTP.
- You must enter the `quote site batch` or `site batch` command to ensure that batch mode is enabled.
- You must have a valid account name and home directory on the UNICOS or UNICOS/mk system.

C.1 FTP Commands

The following sections describe the `del`, `dir`, `get`, `put`, `quote site batch`, and `site batch` FTP commands.

C.1.1 `del` Command

The `del` command has the following format:

```
del job-output | nqs-job
```

The `del` command deletes NQS job output (*job-output*) or NQS jobs (*nqs-job*) when batch mode is on. You can delete the NQS jobs that are specified in a `dir` command display. If any output exists, it also is deleted. You also can delete the NQS output files from your `$HOME/ftpnqs` directory. When you specify the `del` command, it is assumed that the file to be deleted is an output file in the `$HOME/ftpnqs` directory. If the file name exists, it is deleted; if it does not exist, it is assumed to be an NQS job. If no valid NQS job has that name, an error message is displayed.

C.1.2 `dir` Command

The `dir` command has the following format:

```
dir [name]
```

The `dir` command displays NQS status information when batch mode is on. When you enter the `dir` command, it displays a summary of the NQS jobs and a list of your NQS output files. The summary display is the same as the NQS `cqstatl -a -u` *username* or `qstat -a -u` *username* command display. The

output file list is a directory listing of `$HOME/ftpnqs` that is displayed by using the `ls -l` command. When you enter the `dir`*name* argument, a detailed display of a queue or request name is displayed; the detailed display is the same as the NQS `cqstatl -f` *name* or `qstat -f` *name* command display. When batch mode is active, the `ls` command is not an alias for the `dir` command.

C.1.3 `get` Command

The `get` command has the following format:

```
get job-output[local-file]
```

When batch mode is on, the `get` command retrieves the NQS output files (*job-output*) from the `$HOME/ftpnqs` directory. The job output file names have the following formats:

jobname`.e`*seq-number*

(Standard error file)

jobname`.o`*seq-number*

(Standard output file)

The *jobname* is the name of the submitted file name, and *seq-number* is the NQS job sequence number assigned when the file was submitted. If you specify *local-file*, the job output is stored on the local system that uses that file name.

C.1.4 `put` Command

The `put` command has the following format:

```
put local-file [jobname]
```

When batch mode is on, the `put` command transfers a job file from your system (*local-file*) to the UNICOS or UNICOS/mk system and submits the job to NQS. The *jobname* is the assigned job name; the default is the local file name. When the job is completed, the job output is spooled to a file in the `ftpnqs` directory in your home directory. When you submit a job, the `ftpnqs` directory is created in your UNICOS or UNICOS/mk home directory. If the directory already exists, it will be used as it currently exists. The job file can contain

UNICOS or UNICOS/mk commands and, optionally, `cqsub` or `qsub` command options. The FTP interface uses the `-r` option to assign this job name.

C.1.5 `quote site batch` and `site batch` Commands

The `quote site batch` and `site batch` commands have the following formats:

```
quote site batch [on|off]
```

```
site batch [on|off]
```

The FTP `quote site batch` command lets you enter commands at an FTP client that only the UNICOS or UNICOS/mk FTP server understands. The `batch` subcommand of FTP is implemented as an FTP `site` command. The `site batch` command displays the current state of batch mode, and it enables and disables batch mode. The remote user enters this command, and the UNICOS or UNICOS/mk FTP server interprets it.

If you do not specify an option on either command, the current state is displayed (enabled or disabled). If the `batch on` command is entered on either command, batch mode is enabled. If the `batch off` command is entered on either command, batch mode is disabled. You can transfer between file mode and batch mode within one FTP session; this lets you transfer files, switch to batch mode, transfer NQS jobs, and return to file mode without leaving the FTP session. The default at session startup is for the FTP interface to NQS to be disabled. If your site has disabled batch mode and you try to enable batch mode during an FTP session, you will receive the following message:

```
502 Batch command not supported
```

C.2 Sample Session

The following examples represent a sample session that uses the FTP interface to NQS.

C.2.1 FTP Startup

The FTP startup procedure does not change for NQS. You must pass standard user authentication, just as in standard FTP. To start up FTP, enter the `ftp` command. After the server is ready, you can log on to FTP.

```
/home/tree1/abc/nqs/ftp 20 >ftp big
Connected to big.cray.com.
220 big FTP server (Version 5.2 Fri Jan 9 14:09:58 CST 1998) ready.
Name (big:abc): abc
331 Password required for abc.
Password:
230 User abc logged in.
```

C.2.2 Enabling and Disabling the FTP NQS Interface

The following command sequence example shows how to enable and disable batch mode . If you enter the `quote site batch` command, the current state of batch mode is displayed. If you enter the `quote site batch on` command, you will enable batch mode. If you enter the `quote site batch off` command, you will disable batch mode. Batch mode remains enabled to allow the rest of the sample session to continue in batch mode.

```
ftp> quote site batch
200 Batch mode currently disabled
ftp> quote site batch on
200 Batch mode enabled
ftp> quote site batch
200 Batch mode currently enabled
ftp> quote site batch off
200 Batch mode disabled
ftp> quote site batch on
200 Batch mode enabled
```

C.2.3 Submitting a Job File to NQS

In the following example , a file named `job1` on the local machine was submitted to the NQS batch system on the server system. The response shows that the job was submitted and is identified as request `191.big`. The job is identified as `job1` in a `dir` command display. The job output is in a file named `job1.o191` in the `$HOME/ftpnqs` directory.

```
ftp> put job1
200 PORT command successful.
150 Opening ASCII mode data connection for job1.
226 Batch: nqs-181: Request <191.big>: Submitted to queue <batch> by <snow(123)>.
95 bytes sent in 0.006000 seconds (15.46 Kbytes/s)
ftp>
```

The following example submits the file named `job1` with the job name `testjob`. The response shows that the job was submitted and is identified as request `205.big`. Because a job name was specified, it will be identified as `testjob` in a `dir` command display. The job output is in a file named `testjob.o205` in the `$HOME/ftpnqs` directory.

```
ftp> put job1 testjob
200 PORT command successful.
150 Opening ASCII mode data connection for testjob.
226 Batch: nqs-181: Request <205.big>: Submitted to queue <batch> by <snow(123)>.
local: job1 remote: testjob
95 bytes sent in 0.022 seconds (4.3 Kbytes/s)
```

C.2.4 Displaying the NQS Job Status

The following example shows the `dir` command display when batch mode is enabled in FTP. The `dir` command displays the status of NQS jobs that you own. After the `cqstatl -a -u` *username* or `qstat -a -u` *username* command display is shown, an `ls -l` command display is shown to list the NQS job output files in the `$HOME/ftpnqs` directory.

```
ftp> dir
200 PORT command successful.
150 Opening ASCII mode data connection for  (4096 bytes).
--------------------------
NQS BATCH REQUEST SUMMARY
--------------------------
IDENTIFIER    NAME    USER     QUEUE                 JID  PRTY REQMEM REQTIM ST
------------ ------- -------- -------------------- ---- ---- ------ ------ ---
205.big       testjob abc      b_60_4@big          240   23    172     59 R02
no pipe queue entries
no device queue entries
total 9
-rw-r--r--   1 abc      abc         2176 Nov 26 14:46 job1.o191
-rw-r--r--   1 abc      abc         2145 Nov 26 15:40 longqsu.o184
-rw-r--r--   1 abc      abc           77 Nov 26 15:40 longqsubname
226 Transfer complete.
1023 bytes received in 0.7 seconds (1.4 Kbytes/s)
```

The following example shows a display generated by the `dir` request command when FTP enables batch mode. When a request name or queue named is specified, the `dir` command displays the full NQS status of the request or queue. To generate the status display, you can specify the `cqstatl -f` *name* or `qstat -f` *name* command.

```
ftp> dir 207.big
200 PORT command successful.
150 Opening ASCII mode data connection for 207.big (4096 bytes).
------------------------------
NQS BATCH REQUEST: testjob.big                Status:           RUNNING
------------------------------                                  2 Processes
                                                                Active
        NQE Task ID:    --
        NQS Identifier: 207.big                Target User:     abc
                                               Group:           abc
        Account/Project: <snow>
        Priority:        ---
        User Priority/URM Priority Increment: 1
        Job Identifier: 610                    Nice Value:      23
        Local Scheduler: Requested = OS default, Using = OS default

        Created:        Fri Jan 16 1998        Queued:          Fri Jan 16 1998
                        11:14:46 CDT                            11:14:47 CST
<QUEUE>
        Name:           b_60_4@big             Priority:        55
<RESOURCES>
                                 PROCESS LIMIT   REQUEST LIMIT   REQUEST USED
        CPU Time Limit               <55sec>         <60sec>          0sec
        Memory Size                   <4mw>           <1mw>         214kw
        Permanent File Space       <1000gb>      <unlimited>          1kw
        Quick File Space              <0>             <0>             0kw
        Type a Tape Drives                            <0>             0
        Type b Tape Drives                            <0>             0
        Type c Tape Drives                            <0>             0
        Type d Tape Drives                            <0>             0
        Type e Tape Drives                            <0>             0
        Type f Tape Drives                            <0>             0
        Type g Tape Drives                            <0>             0
        Type h Tape Drives                            <0>             0
        Nice Increment                <3>
        Temporary File Space          <0>             <0>
```

```
        Core File Size              <256mw>
        Data Size                   <256mw>
        Stack Size                  <256mw>
        Working Set Limit           <256mw>
        MPP Processor Elements                      <0>             0
        MPP Time Limit                <0sec>         <0sec>          0sec
        Shared Memory Limit                        <10mw>           0kw
        Shared Memory Segments                      <2>             0
        MPP Memory Size             <256mw>        <256mw>          0
<FILES>                 MODE            NAME
        Stdout:         spool           big:/w/abc/ftpnqs/testjob.o207
        Stderr:         spool           big:/w/abc/ftpnqs/testjob.o207
        Restart:                        <UNAVAILABLE>

<MAIL>
        Address         abc@big                 When:

<PERIODIC CHECKPOINT>
        System:         off                     Request:      System Default
        Cpu time:       on /   60 Min           Cpu time:     def/<Default>
        Wall clock:     off/  180 Min           Wall clock:   def/<Default>
        Last checkpoint:None

<SECURITY>
        Submission level:               level0
        Submission compartments:        none
        Execution level:                level0
        Execution compartments:         none
<MISC>
        Rerunnable      yes                     User Mask:      022
        Restartable     yes                     Exported Vars: all
        Shell:          /bin/csh

       Orig. Owner:     123@big
207.big: No such file or directory
226 Transfer complete.
remote: 207.big
1455 bytes received in 1.1 seconds (1.3 Kbytes/s)
```

C.2.5 Deleting a Job or Output File

The following example shows how to delete queued jobs and job output by using the FTP interface to NQS. The first example deletes a job output file. When you enter a `del` command, the `$HOME/ftpnqs` directory is searched for the existence of the file name. If the file name exists, it is deleted.

```
ftp> del job1.o191
250 Batch: Job output job1.o191 Deleted
```

If no matching file name is found, it is assumed to be an NQS job, and a `cqdel -k` *name* or `qdel -k` *name* command is specified to delete the request from NQS.

```
ftp> del 192.big
250 Batch: nqs-98: Request <192.big>: Deleted by <snow(123)>.
```

If the name specified is not an NQS job or an NQS output file, an error message is displayed; the specific message displayed depends on the form of the name entered in the `del` command. In the following examples, a job name that is not valid and a nonexistent job name, respectively, are trying to be deleted.

```
ftp> del job1.o203
250 Batch: nqs-391: Request <job1.o203>: Invalid syntax for request.
```

```
ftp> del 203
250 Batch: nqs-447: Request <203>: does not exist or isn't running at local host.
```

C.2.6 Retrieving Job Output

The following example retrieves an NQS job output file by using the `get` command, which searches for the file name in the NQS job output directory `$HOME/ftpnqs`.

```
ftp> get job1.o192
200 PORT command successful.
150 Opening ASCII mode data connection for job1.o192 (971 bytes).
226 Transfer complete.
local: job1.o192 remote: job1.o192
1004 bytes received in 0.037 seconds (26 Kbytes/s)
```

Glossary

account

A name for a NQS user and associated privileges. On UNICOS systems, *account* can also refer to an additional user identification mechanism you must supply when you use the `cqsub -A` or `qsub -A` command.

batch cluster

A group of interworking NQS/NQE systems with their associated environments. Each batch cluster is a separate administrative domain with separate security, status, and policies.

batch job

A file of commands to be executed in batch mode. See **`request`**.

batch queue

An NQS queue in which requests are executed by the UNIX system. See **`queue`**.

batch request

A file that contains a shell script to be processed either by the batch facility (NQS) or `cron` (the UNICOS `batch` command also uses `cron`).

cluster

A group of computer systems networked together to provide increased throughput, data availability, and automatic workload distribution.

domain

The part of a larger computing resource allocated for the sole use of a specific user or group of users. In a hierarchy, it is a named group that has control over all groups under it, some of which may be domains themselves. A domain is referenced through a construct called **`domain addressing`**. In FTA, domain is a concept that identifies a particular file transfer service provided by a network protocol (for example, OSI, DAP, and TCP/IP). In OSI, a domain is a network that includes smaller networks, such as local area networks, within it. An example of a domain might be a campus network or a large corporate network.

execution priority

Priority type that determines how much priority is given a particular executing request in relation to all other work on the Network Queuing System (NQS) server.

exit events

Unique events for tracking NQS requests.

file

(1) In UNICOS terminology, the major unit of data storage and retrieval in the operating system, consisting of a collection of data in one of several prescribed arrangements and described by control information to which the system has access. It is a set of related records that are treated as a unit; an object that can be written to, or read from, or both. In Cray Research blocked format, a file is terminated by a record control word with 168 in the mode field.

A file has certain attributes, including access permissions and type. File types include regular file, character special file, block special file, FIFO special file, and directory. A file is always identified by an inode, and it has one or more links in the file system that serve as the terminating names in paths to the file. A file must have at least one link; otherwise, it has no name and does not exist (the system deallocates an inode with zero links).

file transfer request

An object that contains information that describes the file transfer operations that FTA will perform on behalf of a user.

file transfer service

A UNICOS utility that performs file transfer operations for a particular domain.

global limits

Limits that restrict the total workload executing concurrently under control of one NQS system.

host

An individual computer on a network; this is a domain name server host name look up command. For more information, see the `hosts`(1) man page.

hostname

The `hostname` is a command that prints the name of the current host system. The system administrator also uses the `hostname` command to set the name of the host system. `hostname` is a BSD command. The ATT equivalent command is `uname`. Although these two commands are not identical, the general function that they perform, obtaining the host identification for the computer on which they are run, is the same.

immediate mode

Mode in which file transfer is executed immediately after a file transfer command is typed.

job control

A means of controlling multiple shells or processes interactively.

job log file

The location to which explanatory messages for request-related events are sent.

load balancing

(1) A process that ensures that each processor involved in a job performs equal work. (2) The process of allocating work (such as Network Queuing System (NQS) batch requests to spread the work more evenly among the variable hosts in a batch cluster.

network peer-to-peer authorization

The network peer-to-peer authorization (NPPA) lets you transfer files without placing your password in job script files or transmitting passwords over the network.

pipe queue

An NQS queue used to route a request to another queue. Each pipe queue has one or more destinations, unless it is using destination selection. A destination consists of a host (local or remote) and another queue (batch or pipe). A request cannot execute until it has been routed to a batch queue. See **queue**.

preexecution priority

A priority that affects the queued NQS request; it determines the order in which requests are chosen to begin execution by NQS.

queue

A list of jobs (such as messages to be transmitted in a data communications system) or datasets that are waiting to be processed by the computer; the arrangements of items determines the processing priority. NQS has batch queues, pipe queues, and destination-selection queues (which are a type of pipe queue). Typically, a user submits a job to a pipe queue, which then routes the job to a suitable bath queue for execution.

queue complex

A set of local batch queues that are grouped by the NQS administrator to simplify NQS administration. Each complex has a set of associated attributes that provide for control of the total number of concurrently running requests in member queues.

queue mode

Mode in which a file transfer request is added to a queue of file transfer requests to await execution.

queue run limit

The maximum number of requests that can be executed concurrently in a queue.

remote file

The File Transfer Agent (FTA) defines a remote file as any file on a remote host.

remote host

Any host computer system, other than the local host, on a network.

request

A set of UNIX commands that has been submitted for execution in batch mode at the UNIX system.

shell script

(1) A program that provides the interface between the human operator and the operating system of a computer. (2) A file that contains commands for the shell to read and execute. Thus, you may preserve a sequence of commands for repeated use by saving them in a file. The preferred terminology is **shell script** rather than **shell program**, **command procedure**, **command file**, **shell procedure**, or **shell code**; but the terminology varies according to local preference.

signal

An electrical quantity that transfers data from one point to another. One software component notifies another component when something significant occurs (messages that inform processes of asynchronous events). A signal, associated with a specific number, is a single integer number that interrupts a process to manifest a condition; for example, `SIGFPE`, which is floating-point exception, request an action (such as `SIGKILL`(9), one of the most common signals which kills the receiving process), completion of I/O, occurrence of a channel interrupt, or request to terminate an activity. The sender of the signal must be the operating system, kernel, the administrator, or another process that has the same owner as the receiving process.

Signals influence the way the software behaves; that is, based on the type of signal received by a software component, a decision is made about which thread or path to follow through the operating system. Some signals inform the process of serious errors (exceptions). The action the process takes in response to the signal depends on the type of signal and whether the program includes a signal handler routine.

Signals are described and defined in the `/usr/include/signal.h` file in UNICOS, and in certain text files in the IOS-E software.

task

A job request that is submitted to the NQE database.

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