Netscape Servers Programmer’s Guide

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Introduction

Welcome to the Netscape Commerce and Communications Servers for Silicon Graphics, Inc. The Netscape Commerce and Communications Servers let people and companies exchange information and conduct commerce over the Internet and other global networks.

The *Netscape Servers Programmer's Guide* documents how to use CGI with your server and how to create CGI programs. It also discusses how to start programming functions you can use in server configuration files to customize how your server works.

What Are CGI and the NSAPI?

CGI defines an interface that lets your server run programs, making your server much more interactive with users. Instead of only sending documents, your server (using CGI programs) can process data, calculate information, perform data searches, and so on. To create CGI programs you need to know a programming language such as Pascal, C or C++ or a scripting language such as Perl.

The Netscape Application Programming Interface (NSAPI) is a set of ANSI C functions and header files that help you create functions to use with the directives in server configuration files. The Netscape Commerce and Communications Servers use this API to build the regular functions for the directives used in both *magnus.conf* and *obj.conf* (these regular functions are described in the *Netscape Commerce and Communications Servers Administrator's Guide*).

Because the servers use this API, you can learn how the servers work. This also means you can override the server functionality, add to it, or customize your own functions to use in addition to it. For example, you can create functions that use a custom database for access control or you can create functions that create custom log files with special entries.

Conventions Used in This Guide

These type conventions and symbols are used in this guide:

Bold—Function names, language keywords, and literal command-line arguments (options/flags).

Italics—Filenames, URLs, IRIX commands, manual/book titles, onscreen button names, and variables to be supplied by the user in examples, code, and syntax statements.

`Fixed-width type`—Error messages, prompts, and onscreen text.

`Bold fixed-width type`—User input, and literals supplied by the user in examples, code, and syntax statements (see also <>).

ALL CAPS—Environment variables, operator names, directives, and defined constants.

"" (Double quotation marks)—Onscreen menu items and references in text to document section titles.

() (Parentheses)—Following function names they contain function arguments (empty if the function has no arguments), and following IRIX commands they surround reference page (man page) section number

[] (Brackets)—Surrounding optional syntax statement arguments

<> (Angle brackets)—Surrounding nonprinting keyboard keys, for example, <Esc>, <Ctrl-D>

#—IRIX shell prompt for the superuser (root)

%—IRIX shell prompt for users other than superuser

Warning: Warnings mark important information. Make sure you read the information before continuing with a task.

CGI Basics

The Common Gateway Interface (CGI) is an interface between your Netscape server and programs you write. CGI lets those programs process HTML forms or other data coming from clients, and then it lets the CGI programs send a response back to the client where the response can be HTML documents, GIF files, video clips, or any data the client browser can view. This makes your Web pages interactive with the user.

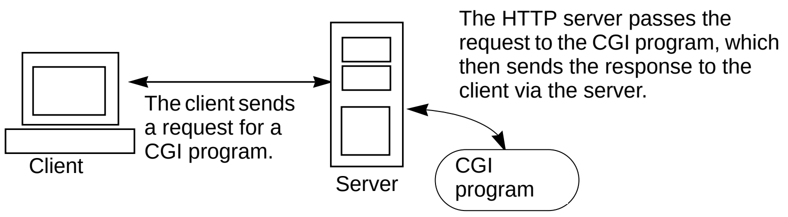

The HTTP server passes the request to the CGI program, which then sends the response to the client via the server.
The client sends a request for a CGI program.
Client
Server
CGI program

Figure 1-1 How CGI Programs Relate to HTTP Clients and Servers

The word *gateway* can be used in two ways. The original meaning describes a gateway to other services through the HTTP server (some of these other services might be Archie/Prospero, WAIS, and so on). Currently, you can't access these services through the World Wide Web, but you can access them through a CGI program and an HTTP server.

Another interpretation defines gateway as a connection between programs and your HTTP server. This is the definition used for CGI. Like a gate in a fence between two fields, CGI rests between your program and the server.

The rest of this chapter describes:

- How CGI works
- Accessing CGI programs with URLs
- Data the server sends to the CGI program
- Output from CGI programs

- Configuring your server to use CGI programs
- A CGI example and development tips

The CGI Request Process in Detail

This section provides an overview of how CGI fits into the interaction of client software like Netscape Navigator and HTTP servers like the Netscape Commerce and Communications Servers. When a client requests a document from a server, the server finds the file and sends it to the client (this is a simplification of the process). However, if a client requests a CGI program, the server simply acts as a middle-man between the client and the CGI program.

The following steps are a very simplified overview of what happens when a client requests a CGI process (in-depth details appear in the following sections). Figure 1-1 is a graphical overview of this process.

1. The client (Netscape Navigator) sends a request to the server for a document. If it can, the server responds to the request directly by sending the document.
2. If the server determines the request isn't for a document it can service, the server creates a CGI process. The CGI process is a copy of the server and has access to certain types of information about the request.
3. The CGI process turns the request information into *environment variables*, and it creates data pathways between the server and external CGI program.
4. After the external CGI program processes the request, it uses the data pathway to send a response back to the server, which in turn, sends the response back to the client.

In reality, the CGI process is a bit more complicated. The specific details that happen at each stage are described in the next few sections.

The Client Sends the Request

The navigation software (the client) sends a request to the Netscape server running on your machine. The request might be for a document, or it might be the contents of an HTML form. If the request is for a regular document (such as an HTML document or a GIF file), the server sends that document directly back to the navigator.

If the request is data intended for an external application, then the server uses CGI to run that application. For example, the client's request might be to search a database. The CGI application takes the search criteria, searches the database, then sends the results back to the client.

The Server Creates the CGI Process

When the server receives a request for an external application, called a *CGI request*, the server creates a copy of itself, called a *CGI process*. The only purpose for this process is to set up communications between the CGI program and the server. This process is one of the processes your server already has allocated with the minimum processes to load feature. You should make sure you have enough processes dedicated to the server to ensure your machine doesn't run out of processes. Also, be careful with CGI programs that can run infinitely because as long as the program runs, your server has one less process for servicing requests.

Because it is a copy of the server, the CGI process has access to information about the CGI request. For example, the CGI process knows

- Which remote host made the request (depending on if your server uses DNS, this can be the user's IP address or hostname).
- Whether that host was authorized with server access control or not.
- What navigation software the remote user is running.

The CGI process stores this information in environment variables.

The Process Assigns Variables and Opens Data Paths

The CGI process takes the data the server has about the current request and puts it into environment variables. The CGI process can send the data to the CGI program as standard input.

The CGI process also creates data pathways between your CGI program and the server. This means the server can send to the program any encoded form data the client submitted, and the external CGI program can send a reply back to the client via the server.

The CGI Program Sends the Response to the Client

The external CGI program takes the data that the server provides, processes it, contacts any external services it needs to (such as Archie or WAIS), and then sends a response to the server via the data pathways using standard output. The server then takes the program's response, prepends any necessary protocol headers to the output, and sends it back to the client software. Your program can output any type of data it needs to, including HTML, GIFs, or JPEGs.

You can also use nonparsed headers to bypass the server and send data directly to the client browser.

Security Concerns with CGI

CGI is a powerful tool for interacting with users, but it can also be a potential security problem. You should follow these guidelines when implementing CGI on your server:

- Check the client's data. The data should be shell escaped.
- Check all filenames and paths. For example, you should check for and not allow paths with /./, /../, or // in them.
- Don't activate CGI in directories where people can upload data. Someone could potentially upload a CGI program that gives them access to other data on your machine.

Accessing CGI Programs with URLs

When responding to a request from a client, the server must figure out if it can handle the request itself or if it must create a CGI process. To determine if a URL that the client requests refers to a CGI program, the Netscape server can use two methods. You can configure the server to use either method, but neither is active by default.

- You can specify a MIME type for CGI programs and then store the CGI programs in the same directories as your HTML documents and graphics. When you use this method, any file with the *.cgi* extension runs as a CGI program. This method is the most flexible, but you need to be careful about which directories you put CGI programs in. You shouldn't put CGI programs in directories where users can upload information because users can then write CGI programs that return information such as your */etc/passwd* file or that delete files from your server machine.
- You can set up a specific directory for CGI programs. This gives you more control over who writes CGI programs and who has access to them. By using this method, you designate certain virtual paths (URL prefixes) as CGI directories. Then, any URL requesting a file inside those directories is executed as a CGI program. A popular example of this method is the prefix */cgi-bin*, which maps to a directory in the server root called *cgi-bin*. The *cgi-bin* directory is where you store all of your CGI programs.

If you try to access a CGI program and you get a server error accompanied by a message such as

```
no way to service request for /some/stuff.cgi
```

in your error log, or if the text of your program appears in the client's window, then you have not properly activated CGI in that directory. See "Configuring Your Server to Use CGI Programs" on page 23 for instructions on configuring your server to use CGI.

Embedding Information in URLs

The method of CGI activation you choose determines only part of the URL used to access your program. URLs to CGI programs can be split into three different parts, shown here in brackets:

virtual path`[`*extra path information*`]?[`*query string*`]`

- The virtual path is similar to a path you would use to access a regular document or image. That is, it points the server to the file that contains the CGI program you want to run.

- Extra path information is embedded in the URL after the program name. Extra path information can be used for two purposes.
    - First, you can use it to convey constant information to your CGI programs independent of the information the client sends.
    - Second, you can use it to access the server's virtual-to-physical path translation. You can send a virtual path as extra path information, so your CGI program can use the path information to access a file on your server machine. This means you don't have to embed file paths inside your CGI URLs. The server provides the physical path name corresponding to that virtual path in the environment variables by using path translation. For example, if your document root directory is */usr/docs/* and a request comes in with extra path information like */test/test.html*, the server translates the path to */usr/docs/test/test.html* and stores that translated path in an environment variable.
- The query string is an optional part of the URL. It can be explicitly entered in your hypertext anchor, it can come from a user typing into a search dialog box for an HTML document with the ISINDEX tag, or it can come from HTML forms (see "Accepting User Input From URLs and Other Sources" on page 7).

The following table shows some sample CGI URLs. In all of these examples, the CGI program name is */misc/search.cgi*, and the document root is in the physical directory */Netscape/docs*.

Table 1-1 Sample CGI URLs

CGI URL	**Description**
http://yourserver/misc/search.cgi	This is a simple URL to the CGI program located at */Netscape/docs/misc/search.cg*i with no extra path information and no search query.
http://yourserver/misc/search.cgi/type=minimal	This example uses embedded extra path information in the URL: /type=minimal. This is the same as sending this information as a query string
http://yourserver/misc/search.cgi/misc/movies.mdb	This URL specifies the extra path information */mis/movies.mdb*. The search script could then use the path information to find and search the database called */Netscape/docs/misc/movies.mdb*.

Table 1-1 (continued) Sample CGI URLs

CGI URL	Description
http://yourserver/misc/search.cgi?sgi	This could be a hyperlink that automatically searches for the word *sgi* without the user having to type anything.
http://yourserver/misc/search.cgi/misc/ movies.mdb?sgi	This hyperlink would automatically return the results of a search for *sgi* in the movies database */Netscape/docs/misc/movies.mdb*.

Accepting User Input From URLs and Other Sources

There are three ways the client can send information to a CGI program:

- HTML form data
- Input to an ISINDEX search dialog
- Clickable images (ISMAP or imagemaps)

When the data is typed as form text, the data is encoded using URL encoding. In URL encoding, there are two rules:

- Spaces are converted to + signs.
- Any of the characters can be "escaped" by changing them into a sequence in the form %*xx*, where *xx* is a hexadecimal digit. For example, **%21** is an exclamation point. See the *Netscape Commerce and Communications Servers Administrator's Guide* for a list of escaped characters.

HTML Form Data

If the data comes from an HTML form, then the location of the data varies depending on the method attribute specified with the FORM tag in your HTML document.

- If the GET method is used, the data comes from the QUERY_STRING variable (as described under QUERY_STRING in "Environment Variables and Their Formats" on page 13).
- If the POST method is used, this information is sent to your program using standard input.

- If ISINDEX is used, the information is sent to your program as command-line arguments.

Wherever the data comes from, it appears in this form:

name1=value1&*name2=value2* . . . &*nameN=valueN*

Note: The Perl and C examples later in the chapter have functions that do this decoding.

If there are any equals signs (=) or ampersands (&) in the data, they're encoded using URL encoding. This avoids ambiguity when your program translates the form data. To properly decode this data, your CGI program should first split it into *name=value* pairs (eliminating the ampersands), then split each pair into a name and a value, and then apply URL decoding to each portion of the pair.

When a user submits a form, you can use the order of the form items to determine what order your CGI program receives the *name=value* pairs. However, you should not depend on this behavior. The various form elements have their own rules for determining what value is associated with the name they are given:

- All of the text input areas use the user's typed input as the value.
- Radio buttons use the value of whichever button is enabled.
- If checkboxes are unchecked, they will use either an empty value string, or their name won't appear in the encoded form data at all.
- Hidden form elements can send constant or per-document data to your script without the user's knowledge or intervention.

Note: The example program documented on "A More Detailed perl Example" on page 31 demonstrates decoding form data.

Input to an ISINDEX Search Dialog

When the data comes from a search dialog resulting from an ISINDEX tag, the escaped character decoding is done by the CGI *process*. Your CGI program receives this information fully translated as command-line arguments. This is handy if you want to avoid the hassle of performing this translation yourself.

ISMAP or Imagemaps

In the case of clickable images, the data you receive from the client software is sent as a query string that takes the form *xx,yy* where *xx* and *yy* are the coordinates of where the user clicked the image. Coordinates are measured as the number of pixels from the upper left hand corner of the image the user clicked. This lets your CGI program respond differently depending on where the user clicked the image.

Data the Server Sends to the CGI Program

The server sends data to the CGI program in three ways: environment variables, standard input, and command-line arguments.

Environment variables are the most common method used to pass data about a request to your CGI program. This data comes from the server software itself, from the network socket connecting the client to the server, and from the URL that was used to access the CGI program (for example, when using the GET method, the data is sent to the QUERY_STRING variable).

This section describes how to get the information stored in environment variables, standard input, and command-line arguments.

Accessing Environment Variables

There are a several ways programs can access environment variables. The method you use depends on what programming or scripting language you use. Environment variables are identified by character strings and have character string values. This section lists some examples of the different methods programming languages use to access environment variables.

Using C or C++

In C or C++ you can use the **getenv** library call to access the environment variables.

```
#include <stdlib.h>
char *rhost = getenv("REMOTE_HOST");
```

Using Perl

In Perl, environment variables are accessed through a simple array.

```
$rhost = $ENV{'REMOTE_HOST'};
```

Using the Bourne Shell (/bin/sh)

In the Bourne shell, environment variables are accessed just like normal shell variables.

```
RHOST=$REMOTE_HOST
```

Using the C Shell

The C shell is similar to the Bourne shell, but it needs the keyword **set** before any variable assignment.

```
set RHOST = $REMOTE_HOST
```

Environment Variables and Their Formats

This sections lists each of the environment variables and their format.

SERVER_SOFTWARE

Gives the name and version of the software that your program is running under.

FORMAT

```
name/version
```

EXAMPLE

```
Netscape-Communications/1.1
Netscape-Commerce/1.1
```

SERVER_NAME

Gives the hostname or IP address of the server machine.

FORMAT

A fully-qualified domain name or IP address

EXAMPLE

```
198.93.93.10 or www.netscape.com
```

SERVER_URL

Gives the URL that individuals should use to access this server.

Note: This variable is *not* supported by revision 1.1 of the CGI interface. It is only available using Netscape server software.

FORMAT

```
protocol://hostname:port
```

If the server is running on a protocol's default port, the :*port* section won't be present.

EXAMPLE

```
http://www.sgi.com
```

GATEWAY_INTERFACE

The revision of the CGI specification supported by the server software.

FORMAT

```
CGI/n.n
```

n.n is the numerical revision.

EXAMPLE

```
CGI/1.1
```

SERVER_PROTOCOL

The name and revision of the protocol being used by the client and server.

FORMAT

```
name/version
```

EXAMPLE

```
HTTP/1.0
```

SERVER_PORT

The port number to which this request was sent.

FORMAT

```
A number between 1 and 65,535
```

EXAMPLE

```
80
```

REQUEST_METHOD

The HTTP protocol defines a number of different methods that are used when accessing URLs on the server. When a hyperlink is clicked, the GET method is used.

When a form is submitted, the method used is determined by the METHOD attribute to the FORM tag. (See "HTML Form Data" on page 7 for more information.)

CGI programs do not have to deal with the HEAD method directly and can treat it just like the GET method.

FORMAT

```
method
```

EXAMPLES

```
GET, HEAD, POST
```

PATH_INFO

The extra path information that the server derives from the URL used to access the CGI program.

FORMAT

```
/dir1/dir2…
```

EXAMPLE

```
/html/graphics/doc1.gif
```

PATH_TRANSLATED

The Netscape server distinguishes between path names used in URLs, and filename path names. It is often useful to make your PATH_INFO a virtual path so that the server provides a physical path name in this variable. This way, you can avoid giving filename path names to remote client software.

FORMAT

```
/dir1/dir2..
```

EXAMPLE

```
/Netscape/docs/doc1.html.
```

SCRIPT_NAME

If your program needs to refer the remote client back to itself, or needs to construct anchors in HTML referring to itself, you can use this variable to get a virtual path to your program.

FORMAT

```
/dir1/dir2/progname
```

EXAMPLES

```
/orders/tickets.cgi, /cgi-bin/order-tickets
```

QUERY_STRING

Gives information from an HTML page to your script in these three instances:

- When a form was accessed with the GET method
- When a page contains an ISINDEX tag and the user executes a search
- When a page contains links with encoded queries

The information sent by the server is encoded using the URL encoding rules described earlier.

FORMAT

```
varies
```

EXAMPLE

With links, you can get **play** or **view** returned from the following:

```
I want to <A HREF=multimed.cgi?play>play some music!</A>
I want to <A HREF=multimed.cgi?view>view a graphic!</A>
```

From a form, you might get **button1=on&button2=off**, or from a document that contains the ISINDEX tag you might get **two+words**.

REMOTE_HOST

Returns the hostname of the remote client software. This is a fully-qualified domain name such as *www.sgi.com* (instead of just *www*).

FORMAT

```
machine.subdomain.domain
```

EXAMPLE

```
www.sgi.com
```

If no hostname information is available, the script relies on the REMOTE_ADDR variable instead.

REMOTE_ADDR

Returns the IP address of the remote host. This information is guaranteed to be present.

FORMAT

```
n.n.n.n
```

n is a number between 1 and 255.

EXAMPLE

```
198.93.93.10
```

AUTH_TYPE

The Netscape server supports HTTP basic access authorization; it will probably support additional types of authorization in the future as standards develop. If the CGI script is protected by any type of authorization, this variable is set to identify the type.

EXAMPLE

```
basic
```

REMOTE_USER

This variable is set to the name of the local HTTP user of the person using the navigation software *only if* HTTP access authorization has been activated for this script's URL. Note that this is not a way to determine the user name of any person accessing your program.

EXAMPLE

```
jdoe
```

CONTENT_TYPE

If a form is submitted with the POST method, then this is the type of data being sent by the client. Note that while clients currently only send *application/x-www-form-urlencoded*, this variable can contain any MIME type. Future systems might use this method to transfer data back and forth.

FORMAT

```
type/subtype
```

CONTENT_LENGTH

Number of bytes being sent by the client. You use this variable to determine the number of bytes you need to read.

EXAMPLE

```
Content-Length: 64
```

Secure Server Variable Formats

The Netscape Commerce Server defines the following additional environment variables to describe the server and client's security status:

HTTPS**—**Depending on whether security is active on the server, this is set to on or off.

HTTPS_KEYSIZE**—**When security is on, this is the number of bits in the session key used to encrypt the session.

HTTPS_SECRETKEYSIZE—is the number of bits used to generate the server's private key.

HTTP Headers as Environment Variables

In addition to the other environment variables, if the client sends any HTTP headers along with its request, then these headers are also placed into the environment. The only exception is the Authorization header.

When put in environment variables, the HTTP headers are prefixed with **HTTP_** and are changed to upper case. All hyphens are changed to underscore characters. Examples of these HTTP headers are described in the following sections.

HTTP_ACCEPT

Enumerates the types of data the client can accept. For most client software, this protocol feature has become a bit convoluted and the information isn't always useful.

FORMAT

```
type/subtype[, type/subtype]…
```

EXAMPLE

```
image/gif, image/jpeg, */*
```

HTTP_USER_AGENT

Identifies the browser software being used to access your program.

FORMAT

```
varies
```

EXAMPLE

```
Mozilla/1.1N (Windows)
```

HTTP_IF_MODIFIED_SINCE

The client requests that the program's response be sent only if the data has been modified since the given date. This date is set according to GMT standard time.

FORMAT

```
Weekday, dd-mon-yy hh:mm:ss GMT
```

Weekday specifies the full name of the day, such as Thursday or Friday. *dd* specifies the number of the day of the month. *mon* specifies the 3-letter abbreviation of the month. *yy* specifies the current year within the century. *hh:mm:ss* gives the current time in 24-hour format.

EXAMPLE

```
Saturday, 12-Nov-94 14:05:51 GMT
```

HTTP_FROM

This is the email address of the remote user. If their client software supports this header, the client software can send it. This header might be user selectable depending on the kind of client software being used.

FORMAT

```
user@machine.subdomain.domain
```

EXAMPLE

```
jdoe@sgi.com
```

Using Standard Input to Get Information

HTML forms that use the POST method send their encoded information using the standard input. You can use the CONTENT_LENGTH environment variable to determine the number of bytes to read in.

Although the only currently used content-type is *application/x-www-form-urlencoded*, you can use the standard input with a custom navigator to send other types of data to your programs via the standard input. For example, a user could send scientific data to your CGI program, which then saves the data to a file on your server machine.

Sending Command-line Arguments to Your CGI Program

Command-line arguments are only used with ISINDEX queries. The query string is split and placed in the command line only if the string doesn't contain = characters (you must encode the = sign if you want to use it as an argument).

Note: Command-line arguments are not used with an HTML form or any undefined query types.

The server searches the query information for a nonencoded = character to determine whether or not to use the command line. This means the client applications must encode the = sign in ISINDEX queries if the CGI program is to use the command-line arguments.

If the server finds any encoded = characters, it decodes the query information by first splitting it at the plus signs in the URL. It then performs additional character decoding before placing the resulting characters as command-line arguments. For example, the information **name+date** is split and sent as command-line arguments **name date** to the CGI program.

Note: If the server cannot send the string due to internal limitations (such as *exec*() or */bin/sh* command line restrictions) the server sends no command-line information and provides the nondecoded query information in the environment variable QUERY_STRING.

Sending Output from CGI Programs

Usually the CGI program's output goes to the client through the server-spawned CGI process. This means your CGI program doesn't have to worry about protocol-specific headers and such. This can make your CGI programs simpler and guarantees that they can take advantage of newer revisions of the protocol with little or no changes to your program code.

However, if you know enough about the HTTP protocol to code the protocol and send it directly back to the client, you can use the non-parsed header feature.

Bypassing the Server: Nonparsed Headers

Nonparsed headers let you bypass the server and send your CGI output directly to the client. As of CGI version 1.1, the only reason you would use this feature is if your program outputs an excessively lengthy amount of data and you want to sidestep the server buffering of your output (not all HTTP servers buffer the output).

To activate the feature, make sure your CGI program names start with the characters *nph-*. The server makes the standard output a direct copy of the socket to the client. Once you activate this feature, your CGI program is responsible for any protocol-related response headers or messages, including the following:

```
HTTP/1.0 200 OK
Date: DayOfWeek, DD-Mon-YY nn:nn:nn GMT
Server: Netscape-Communications/1.1
MIME-version: 1.0
```

Even though you can control the non-parsed header feature, in most cases you should avoid it because CGI programs must print a valid CGI header on the standard output in order for the server to accept the response and send it to the client. In the Netscape server, the standard output and the standard error file streams are directed to the same place: back into the server.

This means that errors your program generates or system utilities your program calls can interfere with your header. Similarly, if your program is abnormally terminated (through a bug or some other disaster), the server will send a server error to the client and describe the error in the server's error log file. Because of this, you should print your header as early as possible in your program.

CGI Generic Headers

When the CGI program sends its output to the server, it begins the text with generic headers. A CGI header consists of several text lines in this format:

```
name: value
```

The end of the header is signalled by a single blank line. After the blank line, the server stops parsing your program's header and sends the rest of your data untouched back to the client. This means that your program can output any type of data it needs to, including HTML, GIFs, or JPEGs.

Each *name: value* pair is an HTTP protocol header. You can output any header you want and the server sends it to the client. However, if the server detects odd header lines, the server logs a 500 error and doesn't return any data to the client.

Some of the commonly used HTTP headers are described here. When you output any of these headers, the server doesn't alter their values or their output.

Content-length

The length of the data in bytes, not including the header.

Content-type

The type of data your program is returning. This is a valid MIME type in the format type/subtype. This header should always be sent from any CGI program.

EXAMPLE

```
text/html, text/plain, image/gif, image/jpeg, audio/basic
```

Expires

Gives the date on which this file should be considered outdated by the client. The date format is the same as the format for **if-modified-since**.

EXAMPLE

```
Saturday, 12-Nov-94 14:05:51 GMT
```

Content-encoding

The data is the given content-type, but it is compressed. Current values that can be used are *x-gzip* for GNU zip compression and *x-compress* for standard UNIX compression.

CGI Specific Headers

The headers listed in this section are special to CGI and make the server act on your program's behalf.

Location

Location sends the location of a new file for the server or client to retrieve. This header must be in one of two forms: a complete URL or a virtual path.

If the value is a full URL, such as *http://yourserver/misc/file.html* then the server redirects the client to the new URL (this is transparent to the user). The client then acts as if it had originally requested that redirected URL, so all relative links in the document of the URL are resolved from the directory specified in that URL. For example, if the URL points to an HTML file with relative paths to graphic files, the client locates the files from the directory where the *.html* file is.

Note: You do not necessarily have to redirect to an HTTP URL; you can redirect to a Gopher, news, FTP, or any other valid URL.

If the location is a virtual path, such as */misc/file.html*, then the server restarts the request using the virtual path, for example *http://yourserver/misc/file.html*.

However, the client isn't informed of the new location, so any relative links in the document are resolved from the directory of your CGI program, not of the document that is actually being returned. This means images referenced in the document might not work because the client might be looking for them in the wrong directory.

Status

Every HTTP request is returned with a status code that indicates to the client whether the request succeeded or not. If the request was unsuccessful, several error codes are provided to tell the client what happened. If the request was successful, there are status codes that indicate a successful request and to ask for further action from the client. If no Status line is provided in the CGI header, the default is "200 OK" unless a Location header with a full URL is present. If the location is present, the default is "302 Found".

The status line has the form *nnn reason*, where *nnn* is the three-digit code for the request, and *reason* is a short string describing the error. The following codes and reasons are currently recognized by Netscape Navigator.

Table 1-2 Status error codes for CGI headers

Error Code	Description
`200 OK.`	The request finished normally.
`204 No response.`	The request was understood and processed, but there is no new document to be loaded by the client.
`302 Found.`	The client should look for data at a new URL, given by a Location header.
`304 Use local copy.`	The client sent a request with an **if-modified-since** header, and the requested data hasn't been modified since the given date.
`400 Bad request.`	The request had illegal or unintelligible HTTP inside.
`401 Unauthorized.`	If access authorization is enabled, the request could not be fulfilled because the user did not provide the proper authorization to access the area. With current authorization schemes, a **WWW-Authenticate** header must be provided to give the client instructions on how to complete the request with the proper authorization.
`403 Forbidden.`	The client is not allowed to access what it requested.

Table 1-2 (continued) Status error codes for CGI headers

Error Code	Description
`404 Not found.`	The client asked for something the server couldn't find.
`500 Server error.`	This is a catch-all error code that indicates something went wrong in the server or the CGI program, and the problem stopped the request from being completed.
`501 Not implemented.`	The client asked the server to perform an action that the server knows about, but can't do.

Sample Program Output

The following CGI program output sends an HTML document back to the client:

Note: Notice the blank line after the header. This lets the server know when the header ends and where document begins.

```
Content-type: text/html

<title>My little document</title>
This is my own little document. Do you like it?
```

The following output instructs the client to retrieve a different URL. The small HTML fragment at the bottom allows any navigation software that doesn't support redirection to retrieve the given URL.

```
Location: http://www.sample.org/abc/afile

This document can be accessed at the following <a
href=http://www.sample.org/abc/afile>location</a>.
```

Configuring Your Server to Use CGI Programs

Before your server can use CGI programs, you must either activate CGI as a MIME type or specify that all files in designated directories are CGI programs.

Specifying a CGI Directory

You can specify a directory that contains only CGI programs. You can also edit and remove current CGI directory mappings.

CGI programs are an excellent way to extend the capabilities of your server. However, they can also be somewhat of a security risk; you might want to keep tabs on all CGI programs in one directory.

You can activate CGI as a file type for part of your server instead of selecting a specific directory. If you do this, any files with the *.cgi* extension is interpreted by the server as a CGI program. This lets you keep your CGI programs next to the HTML files they affect.

Click the link for specifying a CGI directory, then enter a URL prefix that you want to map to a CGI directory. The prefix is used in URLs to indicate the URL specifies a CGI program. For example, you can use the URL prefix *cgi-bin*, which means your URLs will be of the form *http://www.acme.com/cgi-bin/program.*

Next, you specify the directory you want that URL prefix to map to. It should be a full system path.

Activating CGI as a File Type for Parts of the Server

Sometimes, it makes more sense to keep CGI programs near the HTML files that refer to them. You also might not want to have the programs kept in a central directory (for example if you have many people controlling their own directories in the document root).

With CGI active as a file type, any files with the *.cgi* extension are interpreted as CGI programs.

To activate CGI, in the Server Manager, click the link to activate CGI as a file type. Use the buttons at the top of the page to select a resource (the entire server, a directory, or a wildcard pattern of directories—such as **/user-cgi/**), and then check the option that activates the CGI file type.

Setting up a Default Query Handler

Note: See "Sending Command-line Arguments to Your CGI Program" on page 18 for more information on ISINDEX.

The HTML ISINDEX tag is an easy way for a client to send queries to the server. When the server receives a request from an ISINDEX tag, it sends that request to a CGI program that acts as a query handler. You can set a default query handler for part of the server.

In the Server Manager, click the link to set a default query handler. Use the buttons at the top of the page to select a resource. If you choose a directory, then the default query handler you specify runs only when the server receives a URL for that directory or any file in that directory.

Finally, enter the full path name for the CGI program you want to use as the default for the resource you chose.

Customize Server-parsed HTML

Normally, HTML documents are sent to the client exactly as they are stored on disk. However, sometimes you might find it useful to have the server parse these files and insert request-specific information or files into the document. You can do this through server parsed HTML.

To customize server-parsed HTML, click the Server Manager link to the customize form. Use the buttons at the top of the form to select the directory where you want to set up server-parsed HTML.

Next you should choose whether you want to activate the **exec** tag. The **exec** tag lets an HTML file run an arbitrary program on the server (you might want to deactivate **exec** for security or performance reasons).

You also need to choose a method the server uses to determine which files should be parsed. The usual method is to use a file extension of *.shtml* for server parsed HTML files. Sometimes you might not want to use a different filename extension.

The server can also parse only files with the Unix file permissions set so the execute bit is on. This is often unreliable because some documents have the execute bit set even though they aren’t really executable.

The server can also look at every HTML file on the server. This can be a large performance hit because the server must look at every single HTML file it sends back from the parsed directory. (If the directory isn't that large, this may not be that much of a problem.)

Server-parsed HTML Tags

The files the server parses should be tagged with commands the server recognizes. The server replaces the commands with data defined by the commands and their related tags.

The format for the commands is:

```
<!--#command tag1="value1" tag2="value2" … -->
```

The available commands are listed here.

config controls file parsing.

- **errmsg** defines a message sent to the client when an error occurs while parsing the file. The error is also logged in the error log file.
- **timefmt** determines the format of dates when parsed by the server. It uses the same format at the *strftime* library call in Unix.
- sizefmt determines the format of the file size and can be
    - **bytes** is a whole number in the format 12,345,678.
    - **abbrev** abbreviates the number by KB or MB.

include inserts a text file into the parsed file (this can’t be a CGI program). You can chain files by referencing another parsed file, which then includes another file, and so on. The user requesting the parsed document must also have access to the included file if your server uses access control for the directories those files appear in.

- **virtual** is a virtual path to the file.
- **file** is a relative path name from the current directory. You can’t use elements such as ../ and you can’t use absolute paths.

echo sends the data in an environment variable or special variable. You use the tag **var** to specify the variable to *echo*.

fsize sends the size of a file. The tags are the same as **include**. The file size format is determined by the **sizefmt** tag in the *config* command.

flastmod prints the date a file was last modified. The tags are the same as **include**. The date format is determined by the **timefmt** tag in the *config* command.

exec runs a shell command or CGI program.

- **cmd** runs a string using */bin/sh*. You can include any special environment variables in the command.
- **cgi** runs a CGI program and includes its output in the parsed file.

Special Variables for Parsing

In addition to the normal set of environment variables, you can include the following variables in your parsed commands:

DOCUMENT_NAME is the filename of the parsed file.

DOCUMENT_URI is the virtual path to the parsed file (for example, /user/test.shtml).

QUERY_STRING_UNESCAPED is the unescaped version of any search query the client sent with all shell-special characters escaped with the \ character.

DATE_LOCAL is the current date and local time.

DATE_GMT is the same as DATE_LOCAL but in Greenwich mean time.

LAST_MODIFIED is the date the file was last modified.

Add Signatures (Trailers) to Files

You can append a custom trailer to documents within a certain part of the server without having to use server parsed HTML. With server parsed

HTML, you can add a trailer to an HTML file, but sometimes you might not want the overhead of server-parsed HTML; trailers let you do with without parsing the HTML.

In the Server Manager, click the link to add customized signatures. Use the buttons at the top of the form to select the directories of files you want to add custom trailers to. The trailers are added when someone requests the file from your server.

Next, choose what file type to add the trailer to. Type a file extension such as **.html*.

Choose what format the last modification date should have. You can choose from the list of formats given, or you can specify your own using the *strftime* format. See *strftime*(3C) for details on that format.

Finally, you can type your text trailer using HTML tags and entity encoding. You can use up to 254 characters. Any existing trailer appears in the box.

Note: Any entities you type in the trailer are decoded if you later edit the trailer. Be sure to re-encode the entities before submitting the form again! For example, if you use *&amp;* in your trailer, when you later edit the trailer you'll see simply *&*. You need to change *&* to *&amp;* before submitting the form.

Tips for Developing CGI Programs

When developing CGI programs, one of the first things you'll notice is that you can't use a debugger to find out what's wrong with your programs. A primitive but effective solution is to use print statements to print the contents of an environment variable that would normally be sent to the client from your program. You'll need to print a small CGI header before you print the value of a variable, if you haven't already printed a header in your program.

If you're using C to write your program, and you have the *dbx* or *gdb* debugger installed on your system, then you can attach to your program before it begins by placing a call to *sleep* at the beginning of your program.

Make that *sleep* long enough for you to search the process list and attach to that process with your debugger.

Finally, although the CGI specification does not explicitly require it, the Netscape server changes its current directory to the directory where the CGI program resides. This means that if your program dumps core, the *core* file can be found in the directory in which the program is executing (if the user the server is running as can write to that directory).

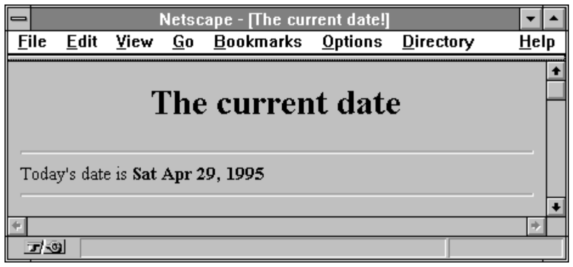
The following sections provide simple examples of CGI programs.

A sample CGI Shell Script

The following shell script is very simple. It sends an HTML page to the client showing the current date in bold type. Figure 1-2 shows the page as a user would see it in Netscape Navigator.

Example 1-1 CGI Shell Script That Prints Current Date

```
#!/bin/sh

# Print out necessary header and empty line
echo "Content-type: text/html"
echo ""

# Print out a title and text. Note the HTML tags in the strings.
echo "<TITLE>The current date!</TITLE>"
echo ""
echo "<H1 align=center>The current date</H1>"
echo "<hr>"
echo ""
echo "Today's date is <b>"

# Echo the date
date +"%a %b %e, %Y"

# Clean up HTML page. Note the ending bold tag.
echo "</b>"
echo "<hr>"
```


Netscape - [The current date!]
File Edit View Go Bookmarks Options Directory Help

The current date

Today's date is **Sat Apr 29, 1995**

Figure 1-2 Current Date As Sent From CGI Shell Script

A Sample CGI Program in *perl*

The following *perl* example prints something different if the user is using Netscape Navigator. This shows how you can do different actions depending on the client browser. This example also shows how you get information from environment variables.

Example 1-2 CGI Perl Example That Checks the User's Client Browser

```
#!/bin/perl
# Remember that the above line must reflect where your perl really resides.
# sample2.pl: A simple Perl CGI program that displays a different message
#             depending on the user's browser.

# Terminate headers
print "Content-type: text/html\n\n";

# Get the User-Agent (also known as client type)
$user_agent = $ENV{"HTTP_USER_AGENT"};

# Print a header with appropriate information
print "  <TITLE>Which browser are you using?</TITLE>
<H1 align=center>Which browser are you using?</H1>";

# Print the browser that they're using.
print "<hr>I'm using <b>".$user_agent."</b><hr>\n";

# If it's Mozilla (Netscape Navigator), tell them how cool they are.
if($user_agent =~ "Mozilla")
  { print "<i>Congratulations!</i>"; }
```

```
else
  { print "<i>To each his own, as they say.</i>"; }

print "<hr>";
```

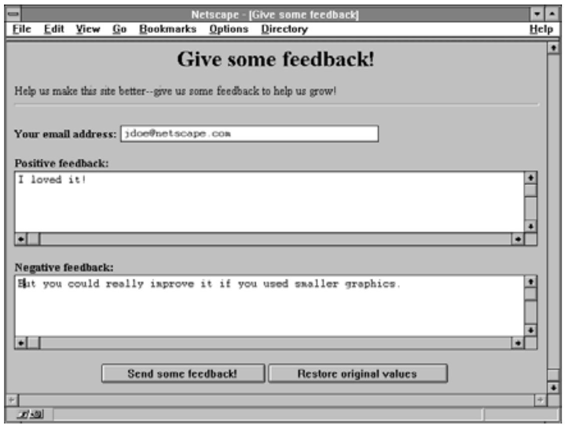
A More Detailed *perl* Example

The following example is a simple HTML form that sends feedback about a server. The *perl* code following the HTML example is a simple form handler that takes the data from the HTML form and mails it to a hard-coded address.

The CGI form handler uses either method=POST and method=GET.

Example 1-3 HTML Source For Form

```
<TITLE>Give some feedback</TITLE>

<h1 align=center>Give some feedback!</h1>
Help us make this site better--give us some feedback to help us grow!
<hr>
<FORM method=POST action=/cgi-bin/sample3.pl>

<b>Your email address:</b> <INPUT type=text name=email size=40>

<p><b>Positive feedback:</b>
<TEXTAREA name=p_feed rows=5 cols=80>I loved it!
</TEXTAREA>

<p><b>Negative feedback:</b>
<TEXTAREA name=n_feed rows=5 cols=80>You could really improve it if you...
</TEXTAREA>

<p><center><INPUT type=submit value="Send some feedback!">
<INPUT type=reset value="Restore original values">

</FORM>
```


Netscape - [Give some feedback]
File Edit View Go Bookmarks Options Directory Help
Send some feedback!
Restore original values

Give some feedback!

Help us make this site better--give us some feedback to help us grow!

Your email address: jdoe@netscape.com

Positive feedback:
I loved it!

Negative feedback:
But you could really improve it if you used smaller graphics.

Figure 1-3 Form As It Appears in Netscape Navigator

Example 1-4 CGI Perl Code That Handles Form Data

```
#!/bin/perl
# Remember that the above line has to reflect where your perl really resides.
This is a
# simple form handler that uses form values to send mail to a hard-coded user.

# Terminate headers
print "Content-type: text/html\n\n";

# Who should get the email and where is the email program?
$send_to = "user@yourserver.yourdomain.dom";
$mail_prog = "/usr/lib/sendmail";

# See if the user sent an HTTP_FROM header. Many clients don't these days.
$http_from = $ENV{"HTTP_FROM"};

# See which method they used to access this form. If they used POST, then
# read the input from STDIN. If they used GET, use the query string.

# Which method is used is determined by the HTML in the form.
if($ENV{'REQUEST_METHOD'} eq "GET") {
  $buffer = $ENV{'QUERY_STRING'};
  if($buffer eq "")  {
    print "<TITLE>Error - use HTML</TITLE>\n";
    print "<H1 align=center>Please use the HTML form provided</H1>\n";
    print "You accessed this program without a valid query string. Please ";
    print "use the associated form to access it.\n";
    exit(1);
  }
}  else  {
  read(STDIN, $buffer, $ENV{'CONTENT_LENGTH'});
}

# Split pairs by the ampersand which divides variables
@pairs = split(/&/, $buffer);
# Create an array, indexed by the variable name, that contains all the values
foreach $pair (@pairs)
{
# Each variable is structured "name1=value1", so split it on those lines
  ($name, $value) = split(/=/, $pair);

# Decode the value (+ is a space, and %xx in hex is an encoded character)
  $value =~ tr/+/ /;
  $value =~ s/%([a-fA-F0-9][a-fA-F0-9])/pack("C", hex($1))/eg;
# Create an array indexed by names and put the value in
  $form{$name} = $value;
}

# We should have the following values:
#  email  = the person's email address
#  p_feed = the person's positive feedback
#  n_feed = the person's negative feedback
#
# Next, we need to put it into a usable form and mail it. Check to see if they
left
# an email address. We don't check to see if it's valid, just to see if it's
there.
if($form{"email"} eq "")  {
  print "<TITLE>Sorry</TITLE>\n";
  print "<h1 align=center>No email address given</h1>\n";
  print "<p align=center>Your request could not be sent because you ";
  print "gave no return address. Please give a return address and ";
  print "try again.</p>\n";
  exit(1);
}

# Open the mail command, or print an error.
open (MAIL, "|$mail_prog $send_to") || die "Could not open $mail_prog";

# Send the feedback. If the user had an HTTP_FROM variable, use that in
# the from line. If not, use the one he gave in the form.
```

```
if($http_from)
  { print MAIL "From: $http_from\n"; }
else
  { print MAIL "From: $form{'email'}\n"; }

# Print their email address as a reply-to, and send him a copy
print MAIL "Reply-to: $form{'email'}\n";
print MAIL "Cc: $form{'email'}\n";

# Terminate mail headers.
print MAIL "\n";

# Create the document body
print MAIL "Feedback from ".$form{'email'}.":\n";
print MAIL "------------------------------------------------------------\n";
print MAIL "\n----Positive feedback----\n";
print MAIL $form{'p_feed'};
print MAIL "\n----Negative feedback----\n";
print MAIL $form{'n_feed'};
print MAIL "\n------------------------------------------------------------\n";

# Close the command, and send the mail.
close (MAIL);

# Now print out a success story, so the user knows it was sent
print "<TITLE>Thanks for your feedback</TITLE>\n";
print "<h1 align=center>Thanks for your feedback</h1>\n";
print "Thanks for taking the time to give us your feedback. We hope that ";
print "with your help, we can make this an even better web site!\n";
print "<hr>";

exit(0);
```

A Sample CGI Program in ANSI C

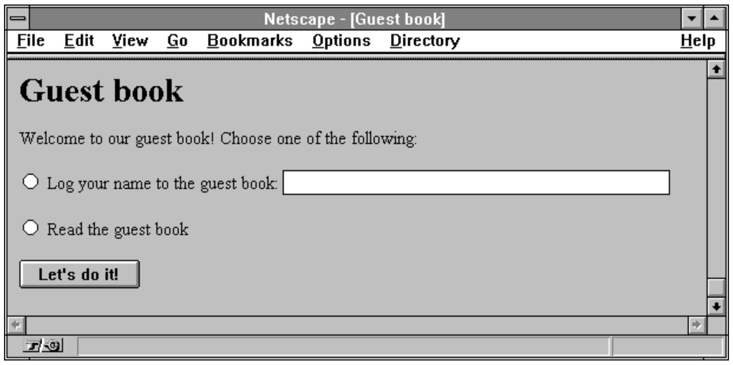
This section describes a sample CGI program that handles the output of an HTML form. The following listing is the text of the HTML form:

Example 1-5 HTML Form That Uses CGI

```
<TITLE>Guest book</TITLE>
<H1>Guest book</H1>
Welcome to our guest book! Choose one of the following:<p>
```

```
<FORM ACTION=gb.cgi METHOD=POST>
<INPUT TYPE=radio NAME=action VALUE=log> Log your name to the
guest book: <INPUT TYPE=text NAME=email SIZE=40><p>

<INPUT TYPE=radio NAME=action VALUE=read> Read the guest book<p>

<INPUT TYPE=submit VALUE="Let's do it!">
</FORM>
```

First the user accesses the HTML form as **/guestbook/gb.html**. Once the user selects an action and optionally types in a name for the guest book, they click the submit button. Note that the name of the radio button is **action**, and can have the values **log** or **read**. Also note that there is a text area called **email**.



Guest book

Welcome to our guest book! Choose one of the following:

○ Log your name to the guest book:

○ Read the guest book

Let's do it!

Figure 1-4 Sample guest-book/gb.html As It Appears In Client

The following code is for the program called when the user submits this form. In this example, the server administrator has activated CGI as a file type, so the compiled program that goes with this code is called *gb.cgi*.

Note: For brevity, the entire code necessary to actually update or maintain a guest book is not provided. Only the code necessary to get information to and from the server and client through CGI is shown.

This program takes the output of a form and processes it. If the user entered their name, then the program enters it into a guest book. If the user decided to view the guest book, they are redirected to a new URL. The function to update the guest book is not actually provided here, in order to keep the focus on CGI.

The comments to the right of the following header-file includes indicate which function prototypes are used from that header file.

```
#include <stdio.h>  /* stdin, printf, fread */
#include <stdlib.h> /* malloc, getenv */
#include <ctype.h>  /* isalpha */
#include <string.h> /* strchr, strcmp */
```

The program begins with some defines and prototypes. Code execution begins in the main function later in the code.

```
/* The biggest set of form data we’ll accept. This is a small form. */
#define MAX_CONTENT_LEN 2048

/* Function defined below prints an error to the client and exits. */
void err(char *s);

/*
 * Function defined below takes a pointer to some URL-encoded
 * data and allocates a new string, copies and decodes the data into
 * that string, and returns the new string.
 */
char *url_decode(char *encoded);
/* This function logs the given email address to the guest book. */
void log_address(char *email)
{
  /* This code is not provided...it should be straightforward. */
}
int main(int argc, char *argv[]}
{
```

The previous functions and defines are used in the main subroutines where the program starts. Note that the command-line parameters to main are defined but not used. It begins by defining and initializing its variables. The variables that aren’t initialized here are initialized later as they are needed.

```
/*
 * Get the method used to access the script from the environment. This
 * form uses the POST method, and using any other results in an error.
 */
char *method = getenv(“REQUEST_METHOD”);
/* The length of the form results the browser sends us (set below) */
```

```
char *clstr;
int clen;
/* We hold the form contents in this buffer (+1 for the null) */
char content[MAX_CONTENT_LEN +1];
/* Return code from system or library calls */
int ret;
/* Pointers used to parse the form data */
char *name, *value;
/* A pointer for the remote person's email address */
char *email = NULL;
/*
 * Which action the user selected. -1 is invalid and used to indicate
 * that no action was selected.
 */
int action = -1;
```

The execution code begins in the following section. The first thing this program does is check the data the server provides in the environment variables to see if it is correct. If it isn't, the request can't proceed and a message is sent to the client navigation software.

```
/* First, see if they got the method right. */
if(strcmp(method, "POST") !=0)
   err("you must submit a <a href=gb.html>form</a> to access this URL.");
/* Make sure we got form data and check its length */
clstr = getenv("CONTENT_LENGTH");
if(!clstr)
   err("your browser didn't send any content. Is it not POST capable?");
/* Change that string into a number */
clen = atoi(clstr);
/* Make sure it's really form data */
if(strcmp(getenv("CONTENT_TYPE"), "application/x-www-form-urlencoded")
!=0
   err("your browser sent the wrong content type.");
/*
 * Check for negative or outrageously large content lengths
 * An upper limit is set to make sure they don't steal extra system
 * resources for no good reason
 */
if((clen < 0 || (clen >= MAX_CONTENT_LEN))
   err("your browser created too much data from that tiny form.");
```

If the variables appear to be set correctly, the program can then read the form data into a string variable.

```
/* Read in the data in one shot */
ret = fread(content, 1, clen, stdin);
/* Return of < 1 means either EOF or error */
if(ret <1)
   err("an I/O error occurred before your form data could be read.");
/* Terminate it with a null char */
content[ret] = '\0';
```

When the program has the string of data the client sent, the program parses that string of data. This involves splitting the string into *name=value* pairs, splitting those pairs into *name* and *value* strings, and then URL-decoding those strings.

```
/*
 * Here's where the fun starts. Most of the time, you will want to create
 * a generic function to decode form data, and then use that routine in
 * your script.
 *
 * Form data looks like this:
 * name1=value1&name2=value2...
 *
 * The nameN and valueN strings are URL-encoded, which means that many
 * special characters such as spaces, semicolons, forward or back slashes,
 * question marks, percent signs, newlines, plus signs, and colons will be
 * changed from one character into three, of the form %xx, where x is a
 * hexadecimal digit. These two digits are changed into a number from 0-255,
 * which is interpreted as a character.
 *
 * Further, many browsers turn spaces into plus signs.
 */
  /* Start our name pointer at the beginning of the data */
  name = content;
  /* name will be set to NULL by some of the code below when we're done */
  while(name && (*name != '\0')) {
     /* We first find somewhere to put the value pointer */
     value = strchr(name, '=');
     /* However, we must check to make sure we got the right data */
     if(value == NULL)
        err("the submitted form data was corrupt.");

     /* Otherwise, mark the end of the name string. */
     *value++ = '\0';

     /*
      * We now have the name string by itself. See what it is.
      * Note that we do not URL-decode the name string, because our form
      * is set up such that the names don't use any bad characters.
      */

  if(strcmp(name, "action") == 0) {
     /* First, find the next name string. NULL indicates the last one */
     name = strchr(value, '&');
     if(name != NULL)
        *name++ = '\0';
     /*
      * Action can have two values: "log" and "read". Again, we
      * avoid URL-decoding the value because we don't use any
      * special chars in our form.
      */
     if(strcmp(value, "log") == 0)
        action = 1;
     else if(strcmp(value, "read") == 0)
        action = 2;
     else
         err("your form results had an invalid action.");
  }
  else if(strcmp(name, "email") == 0) {
     /* Find the next name string. NULL indicates the last one */
     name = strchr(value, '&');
     if(name != NULL)
        *name++ = '\0';

     /*
      * The email value will be an email address, which can have
      * weird % signs and ! marks in them. We have to URL decode
      * this string. url_decode is defined below.
      */
     email = url_decode(value);
  }
}
```

After the program has the data in the email and action variables, it can verify that the form was filled out in its entirety.

```
/* Check to make sure they filled out the necessary data. */
if(action == -1)
   err("you did not pick a button.");
if((action == 1) && ((email == NULL) || (*email == '\0')))
   err("you did not fill out your email address");
```

Finally, the program looks at the action the user selected and does what they asked it to do. Note that there is an example of returning a new document (a success page in HTML) and an example of redirecting the client to a new URL (the one that has the guest book for them to view).

```
  /* Now that we have the data, do something with it. */
  if(action == 1) {
     /* Log their email address */
     log_address(email);

     /* Now generate a success page */
     printf("Content-type: text/html\n\n");
     printf("<title>Congratualtions</title><h1>Congratulations</h1>\n");
     printf("Your name has been added to our guest book, %s!\n", email);
  }
  else {
     /* View the guest book */

     /*
      * Instead of printing a new HTML page, this function sends them to
      * a new URL. This URL is hard-coded to a certain location, but uses
      * CGI variables to get the server's hostname and port.
      */

     printf("Location: http://%s:%s/guestbook/guests.html\n\n",
          getenv("SERVER_NAME"), getenv("SERVER_PORT"));
  }
  return 0;
}
```

The main program calls the following supporting functions to perform some basic tasks.

```
/* -------------------- Function: err --------------------- */

/* Returns an error to the client */
void err(char *s)
{
   /* Print the CGI header telling the client that this is HTML */
   printf("Content-type: text/html\n\n");

   /* This generates HTML for the client, telling them what went wrong. */
   printf("<title>Guestbook error</title><h1>Guestbook error</h1>\n");
   printf("Your form results could not be processed because %s.\n");
   /* Now, just exit and let them try again */
   exit(0);
}
```

The following functions perform URL decoding on the string.

```
/* -------------------- Function: url_decode --------------------- */

/* First, a function that verifies that a 2-char string is a hex digit */
int is_hex(char hex)
{
   /* Make sure it's upper case */
   if(isalpha(hex))
      hex = toupper(hex);

   /* This just checks the character to see if it's in the two ranges */
   if(((hex < 'A') && (hex > 'F")) && ((hex < '0') && (hex > '9')))
      return 0;
   else
      return 1;
}

char *url_decode(char *encoded)
{
   /* Allocate space for the new string. We won't need more space than we
      already have after decoding */
   char *new = (char *) malloc((strlen(encoded) + 1) * sizeof(char));
   /* Index register for string copy */
   char *enc, *dec;
   /* Digit is used to translate hex into character */
   char digit;

   if(new == NULL)
      err("the program ran out of memory.");

   /* We go through the string, looking for + signs or percents */
   for(enc = encoded, dec = new; *enc; enc++, dec++) {
      if(*enc != '%') {
         /* Plus goes to space, but most chars are untouched */
         if(*enc == '+')
            *dec = '';
         else
            *dec = *enc;
   }
   else {
       /* Another tricky part. First, make sure we got what we want. */
       if((!is_hex(enc[1])) || (!is_hex(enc[2])))
         err("invalid escape sequence");

      /* Now, advance over the % sign to the first digit, and decode. */
      /* The Oxdf is to turn the character into upper case */
      ++enc;
      if(*enc >= 'A')
         digit = 16 * (((*enc & Oxdf) -'A') + 10);
      else
         digit = 16 * (*enc - '0');

      /* Finally, transfer the digit to the new string. */
      *dec = digit;
   }
  }
  *dec = '\0';

  return new;
}
```

Chapter 2

Netscape API Functions

This chapter describes the Netscape Server Application Programming Interface (NSAPI). This chapter describes how to create and compile your custom functions and how to use the functions you create. This chapter also lists the header files you need when programming your custom functions.

Note: Before creating custom functions, you should be familiar with the server configuration files. See the *Netscape Commerce and Communications Servers Administrator's Guide* for information on the configuration files called *magnus.conf* and *obj.conf*.

What is the NSAPI?

The NSAPI is a set of functions and header files that help you create functions to use with the directives in server configuration files. The Netscape Commerce and Communications Servers use this API to build the regular functions for the directives used in both *magnus.conf* and *obj.conf* (these regular functions are described in the *Netscape Commerce and Communications Servers Administrator's Guide*).

Because the servers use this API, you can learn how the servers work. This also means you can override server functionality, add to it, or customize your own functions to use in addition to it. For example, you can create functions that use a custom database for access control or you can create functions that create custom log files with special entries.

The following steps are a brief overview of the process for creating your custom server application functions:

1. You write code for the custom functions you want to use. Each function you create is written specifically for the directive it will be used with in the configuration files.
2. You compile your code to create a shared object file (*.so* file).

3. In *magnus.conf* you tell the server to load your shared object file.
4. You use your custom functions in your server configuration files (*magnus.conf* and *obj.conf*).

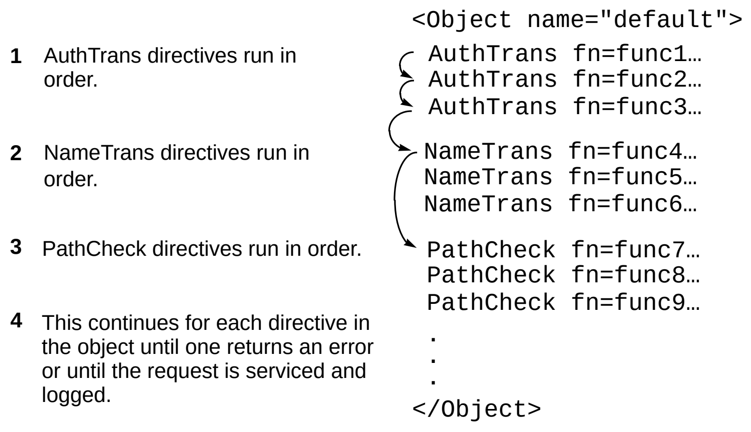
Before you program your functions, you should understand how the server handles requests. The following section describes this process.

How the Server Handles Client Requests

When the server is started, it loads the `magnus.conf` file, which contains information the server uses to configure itself. For example, the file tells the server what port to bind with, what the server name is, what user account to use after start-up, and so on.

Once running, the server waits for requests to come in from client applications (such as Netscape Navigator). When a request comes in, the server uses another file, `obj.conf`, to determine if and how it should service the request. For example, the *obj.conf* file tells the server if a user has access to the document they're requesting, and if they have access, it determines (among other things) if the server should attach information to the document when it sends it to the client. This process is much more detailed, as described here and in the following sections.

The Netscape server design breaks down the process of responding to a request so that each step in the process is done once for all objects matching the request, then another step is done for all objects, and so on. For example, authorization translation (the first step) is performed on all objects in *obj.conf*, and then name translation (the second step) is done for all objects.



1 AuthTrans directives run in order.

2 NameTrans directives run in order.

3 PathCheck directives run in order.

4 This continues for each directive in the object until one returns an error or until the request is serviced and logged.

```
<Object name="default">
  AuthTrans fn=func1…
  AuthTrans fn=func2…
  AuthTrans fn=func3…
 NameTrans fn=func4…
 NameTrans fn=func5…
 NameTrans fn=func6…
  PathCheck fn=func7…
  PathCheck fn=func8…
  PathCheck fn=func9…
  .
  .
  .
</Object>
```

Figure 2-1 How the Server Uses Directives and Functions in an Object

Note: For more information on creating functions for these directives, see .

The process steps are as follows:

1. Authorization translation. Translate any authorization information sent by the client into a user and a group. If necessary, decode the message to get the actual request. Also, user authorization is available through user databases.
2. Name translation. Before anything else is done, a URL can be translated into a filesystem-dependent name (an administration URL), a redirection URL, mirror site URL, or it might be kept intact and retrieved as-is (the normal server case).
3. Path checks. Perform various tests on the resulting path, largely used to make sure that it's safe for the given client to retrieve the document (only for local access).
4. Object types. Determine the MIME type information for the given document. MIME types can be registered document types such as text/html and image/gif, or they can be internal document identification types. Internal types always begin with magnus-internal/, and are used to select a server function to use to decode the document. (Only used for local access; the server system calls these routines automatically when necessary.)

5. Service. Select an internal server function that should be used to send the result back to the client. This function can be the normal server-service routine, it can return a custom document, or it can run a CGI program.
6. Add Log. Record information about the transaction.
7. Error. Controls how the server responds to the client when it encounters an error.

If at any time one of these steps fails, another step must be taken to handle the error and inform the client about what happened. In this case, the Netscape HTTP server lets you customize the response that is sent with more site-specific information about the error.

What are Server Application Functions?

To accomplish each of the request response steps, a set of server application functions are used in each step. These functions take the client's request and the server's configuration variables as input and return a response to the server as output.

Server application functions belong to a particular class that corresponds to the directive they're called with in the configuration files. The functions appear after the directive type in *obj.conf*. You use the format:

directive `fn="`*yourfunction*`"` *value*`="`*v1*`"` ... *value*`="`*vn*`"`

directive is the directive the function belongs to (for example, AuthTrans). You can then send any number of optional values to your function as arguments you specify in *obj.conf*. For example, you could create a NameTrans function called **myfunc1** that takes a URL path as a value and maps it to a hard-coded path specified in your function. The entry in *obj.conf* might look like this:

```
NameTrans fn="myfunc1" path="/special/docs"
```

The response can tell the server to do the following (REQ stands for request):

- REQ_PROCEED indicates that the function has performed its task without a problem. When a NameTrans, Service, or Error function returns this, the server skips any other directives of the same type and moves to the next type of directive in an object. However, with

AuthTrans, PathCheck, ObjectType, and AddLog functions, a REQ_PROCEED value is the same as REQ_NOACTION—the server moves to the next line in the object.

- REQ_ABORTED indicates that an error occurred and that the request (not necessarily the session) should be terminated.
- REQ_NOACTION indicates that the function found conditions such that it did not perform its intended action. The meaning of this depends on the step being performed, but usually the server moves to the next line in the object file.
- REQ_EXIT should only be used when a read or write error has occurred while talking to the client, and the entire session cannot continue.

There is an additional class of application function, called initialization functions, that run when the server starts. They perform static data initialization for the various server modules. Server application functions and the custom functions you create work with a single directive class.

Note: Before you can use any of your custom server application functions, you must tell the server to load the functions. You do this in *magnus.conf*. The full process is described later in this chapter.

Programming Custom Functions

This section describes how to begin programming your custom functions. This section also describes the header files you need to include in your code. See the section "Compiling Your Code" on page 64 for additional information.

The server root directory has a subdirectory called */nsapi* that contains sample code, the header files, and a makefile. You should familiarize yourself with the code and samples. This documentation is written as a starting point for exploring that code.

- The *nsapi/examples/* directory contains C files with examples for each class of function you can create.
- The *nsapi/include/* directory contains all the header files you need to include when programming your custom functions.

The server and its header files are written in ANSI C.

The NSAPI Header Files

This section describes the header files you can include when programming your custom functions. This section is intended as a starting point for learning the functions included in the header files.

Header files are stored in two directories:

- *nsapi/include/base* contains header files that deal with low-level, platform independent functions such as memory, file, and network access.
- *nsapi/include/frame* contains header files of functions that deal with server and HTTP-specific functions such as handling access to configuration files and dealing with HTTP.

Table 2-1 Header Files in the base Directory

Header File	Description
buffer.h	Contains functions that buffer I/O.
cinfo.h	Contains functions for object typing, specifically mapping files to MIME types.
daemon.h	Contains functions called from other header files. It also contains functions that manage group processes that run the server.
ereport.h	Contains functions that handle low-level errors.
file.h	Contains functions to handle file I/O.
net.h	Contains functions for I/O with the client software over the network.
netsite.h	Contains miscellaneous functions.
pblock.h	Contains functions that manage parameter passing and server internal variables. It also contains functions to get values from a user via the server.

Table 2-1 (continued) Header Files in the base Directory

Header File	**Description**
sem.h	Contains semaphores in platform-independent ways (they prevent two processes from doing the same thing).
session.h	Contains session data structures for IP addresses, security, and so on.
shexp.h	Contains functions to customize wildcard patterns through parsed data.
systems.h	Contains functions that handle Unix systems information.
util.h	Contains utility functions.
buffer.h	Contains functions that buffer I/O.
cinfo.h	Contains functions for object typing, specifically mapping files to MIME types.
daemon.h	Contains functions called from other header files. It also contains functions that manage group processes that run the server.
ereport.h	Contains functions that handle low-level errors.
file.h	Contains functions to handle file I/O.
net.h	Contains functions for I/O with the client software over the network.
netsite.h	Contains miscellaneous functions.

Getting Data From the Server: the Parameter Block

The server stores variables in *name=value* pairs. The parameter block, or **pblock**, is a hash table keyed on the *name* string. The **pblock** maps these name strings with their value character strings.

Basically, your custom functions use parameter blocks to get, change, add, and remove *name=value* pairs of data. Before learning about the functions you use to do these actions, it's helpful to know how the hash table is formed and how the data structures are managed.

Data Structures

The **pb_param** structure is used to manage the *name=value* pairs for each client request. The **pb_entry** structure creates linked lists of **pb_param** structures.

The **pblock** is the hash table that holds these **pb_entry** structures. Its contents are transparent to most code.

Example 2-1 How the Parameter Block Is Built From Data Structures

```
#include "base/pblock.h"

typedef struct {
    char *name,*value;
} pb_param;

struct pb_entry {
    pb_param *param;
    struct pb_entry *next;
};

typedef struct {
    int hsize;
    struct pb_entry **ht;
} pblock;
```

Passing Parameters to Server Application Functions

All server application functions (regardless of class) are described by the following prototype:

```
int function(pblock *pb, Session *sn, Request *rq);
```

pb is the parameter block with the parameters given by the site administrator for this function invocation. This parameter should be considered read-only, and any data modification should be performed on copies of the data. Doing otherwise is unsafe in threaded server architectures, and will yield unpredictable results in multiprocess server architectures.

Public Functions

When adding, removing, editing, and creating *name=value* pairs, you use the following functions. This list might seem overwhelming, but you'll use only a handful of these functions in your custom application functions. For a more detailed look, see the code in the header file */base/pblock.h*.

FUNCTION

```
pb_param *param_create(char *name, char *value);
```

The **param_create** function creates a parameter with the given name and value. If name and value aren't NULL, they are copied and placed into the new **pb_param** structure.

FUNCTION

```
int param_free(pb_param *pp);
```

The **param_free** function frees a given parameter if it's non-NULL, and it returns **1** if **pp** was non-NULL and returns 0 if **pp** was NULL. This is also useful for error checking before using **pblock_remove**.

FUNCTION

```
pblock *pblock_create(int n);
```

The **pblock_create** function creates a new **pblock** with a hash table of size *n*. It returns the newly allocated **pblock**.

FUNCTION

```
void pblock_free(pblock *pb);
```

The **pblock_free** function frees the given **pblock** and any entries inside it. If you want to save anything in a **pblock**, remove its entities with *pblock_remove* first and then save the pointers you get.

FUNCTION

```
pblock *pblock_find(char *name, pblock *pb);
```

The **pblock_find** function finds the *name=value* entry with the given name in **pblock pb**. If it's successful, it returns the param block. If not, it returns

NULL. You then use **pblock_findval** to get the actual value in the *name=value* pair.

Note: This function is actually a macro that calls a separate function with a hard-coded third parameter.

FUNCTION

```
char *pblock_findval(char *name, pblock *pb);
```

The **pblock_findval** function finds the *name=value* entry with the given name in **pblock pb** and returns its value; otherwise, it returns NULL.

FUNCTION

```
pblock *pblock_remove(char *name, pblock *pb);
```

The **pblock_remove** function behaves exactly like **pblock_find**, but it removes the given entry from **pb**.

This function is actually a macro that calls a separate function with a hard-coded third parameter.

FUNCTION

```
pb_param *pblock_nvinsert(char *name, char *value, pblock
*pb);
```

The **pblock_nvinsert** function creates a new parameter with the given name and value and inserts it into **pblock pb**. The name and value in the parameter are also newly allocated. Returns the **pb_param** it allocated (in case you need it).

FUNCTION

```
void pblock_pinsert(pb_param *pp, pblock *pb);
```

The **pblock_pinsert** function inserts a **pb_param** into a pblock.

FUNCTION

```
int pblock_str2pblock(char *str, pblock *pb);
```

The **pblock_str2pblock** function scans the given string **str** for parameter pairs in the format *name=value* or *name=*"*value*". Any backslash ("\") must be followed by a literal character. If string values are found with no unescaped equal ("=") signs (no name=), it assumes the names 1, 2, 3, and so on depending on the string positions (zero doesn't count). For example, if it finds `"some" "strings" "together"`, the function treats the strings as if they appeared in the name=value pairs as `1="some" 2="strings" 3="together"`.

This function returns the number of parameters added to the table, or it returns **-1** if it encounters an error.

FUNCTION

```
char *pblock_pblock2str(pblock *pb, char *str);
```

The **pblock_pblock2str** function places all of the parameters in the given pblock into the given string (NULL if it needs creation). It will re-allocate more space for the string. Each parameter is separated by a space and of the form *name="value"*

Data Structures and Data Access Functions

A session is the time between the opening and the closing of the connection between the client and the server. The Session data structure holds variables that apply session wide, regardless of the requests being sent, as shown in the following code.

Example 2-2 The Session Data Structure

```
#include “base/session.h”

typedef struct {
    /* Information about the remote client */
    pblock *client;

    /* The socket descriptor to the remote client */
    SYS_NETFD csd;
    /* The input buffer for that socket descriptor */
    netbuf *inbuf;

   /* Raw socket information about the remote */
   /* client (for internal use) */
```

```
    struct in_addr iaddr;
} Session;
```

The **client** parameter block used in the previous Session structure contains two entries:

- **ip** is the IP address of the client host.
- **dns** is the DNS name of the remote host. This member must be accessed through the **session_dns** function call:

```
#include “base/session.h”
/*
 * session_dns returns the DNS hostname of the client for this
 * session and inserts it into the client pblock. Returns NULL if
 * unavailable.
 */

char *session_dns(Session *sn);
```

With HTTP there is only one request per session. The following structure contains the variables that apply to the request in that session (for example, the variables include the client’s HTTP headers):

```
#include “frame/req.h”

typedef struct {
    /* Server working variables */
    pblock *vars;

    /* The method, URI, and protocol revision of this request */
    pblock *reqpb;
    /* Protocol specific headers */
    int loadhdrs;
    pblock *headers;

    /* Server’s response headers */
    pblock *srvhdrs;

    /* The object set constructed to fulfill this request */
    httpd_objset *os;

    /* The stat last returned by request_stat_path */
    char *statpath;
    struct stat *finfo;
} Request;
```

vars are the server's working variables. The set of active variables is different depending on which step of the request the server is processing, as discussed in "Conditions for Each Function Class" on page 60.

reqpb contains the request parameters that are sent by the client:

- **method** is the HTTP method used to access the object. Valid HTTP methods are currently GET, HEAD, and POST.
- **uri** is the URI the client asked for. The uri is the part of the URL following the host:port combination. This URI is unescaped by the server using URL translations.
- **protocol** identifies the protocol the client is using.
- **clf-request** is the full text of the first line of the client's request. This is used for logging purposes.
- **headers** is a pblock that contains the client's HTTP headers. HTTP sends any number of headers in the form (RFC 822):

  ```
  Name: value
  ```

If more than one header has the same name, then they are concatenated with commas as follows:

```
Name: value1, value2
```

The parameter block is keyed on the fully lowercase version of the name string without the colon. Application functions should not access this **pblock** directly, but instead use the function **request_header**, which finds the named header depending on the requesting protocol.

FUNCTION

```
#include "frame/req.h"
int request_header(char *name, char **value, Session *sn,
Request *rq);
```

Name should be the lowercase header name string to look for, and **value** is a pointer to your **char *** that should contain the header. If no header with the given name was sent, value is set to NULL.

The server might not load headers until the first header is requested. This increases performance when talking to certain NCSA products. This option is not currently active.

If this option is active, the function can return REQ_ABORTED. If it does, your function should return REQ_ABORTED. On success, this returns REQ_PROCEED.

Caution: Currently, it's safe to access the pblock instead of using this function, but this behavior should not be relied upon.

The **srvhdrs** pblock in the Sessions structure is the set of HTTP headers for the server to send back. This pblock can be modified by any function.

The last three entries in the Session request structure should be considered transparent to application code because they are used by the server's base code.

After the server has a path for the file it intends to return, application functions should use the following call to obtain **stat()** information about the file:

```
#include “frame/req.h”

/*
 * request_stat_path tries to stat path. If path is NULL, it will look in
 * the rq->vars pblock for “path”. If the stat is successful, it returns the
 * stat structure. If not, returns NULL and copies an error message into err.
 * If a previous call to this function was successful, and path is the same,
 * the function will simply return the previously found value.
 *
 * Application functions should not free this structure.
 */

struct stat *request_stat_path(char *path, char *err, Request *rq);
```

Using this function avoids multiple, unnecessary calls to **stat()**.

Application Function Return Codes

When your custom application function is done working with the *name=value* pairs, it must return a status code that tells the server how to proceed with the request. The following integer return codes are available to server application functions:

- **`#define REQ_PROCEED 0`** indicates that the function has performed its task without a problem.

- **`#define REQ_ABORTED -1`** indicates that an error has occurred and that the request (not necessarily the session) should be terminated.
- **`#define REQ_NOACTION -2`** indicates that the function found conditions such that it did not perform its intended action. The meaning of this depends on the step being performed (see below).
- **`#define REQ_EXIT -3`** should only be used when a read or write error has occurred while talking to the client, and the entire session cannot continue.

Reporting Errors to the Server

When problems occur, the server application functions should set server status codes that give the client an idea of what went wrong. The function should also log an error in the server error log file.

There are two interfaces for reporting errors: setting a response code and reporting an error.

Setting a Response Status Code

The **protocol_status** function sets the status to the code and reason string. If the reason is NULL, the server attempts to match a string with the given status code (see Table 2-2). If it can’t find a string, it uses “Because I felt like it.”

```
#include “frame/protocol.h”
void protocol_status(Session *sn, Request *rq, int n, char\
*r);
```

Generally, **protocol_status** will be called with a NULL reason string, and one of the following status codes defined in *protocol.h*. (If no status is set, the default is PROTOCOL_SERVER_ERROR.)

Table 2-2 Status Codes Used with protocol_status

Status code	Definition
`PROTOCOL_OK`	Normal status, the request will be fulfilled normally. This should only be set by Service class functions.
`PROTOCOL_REDIRECT`	The client should be directed to a new URL, which your function should insert into the rq->vars pblock as url.
`PROTOCOL_NOT_MODIFIED`	If the client gave a conditional request, such as an HTTP request with the if-modified-since header, then this indicates that the client should use its local copy of the data.
`PROTOCOL_BAD_REQUEST`	The request was unintelligible. Used primarily in the framework library.
`PROTOCOL_UNAUTHORIZED`	The client did not give sufficient authorization for the action it was trying to perform. A `WWW-authenticate` header should be present in the `rq->srvhdrs` pblock that indicates to the client the level of authorization it needs to perform its action.
`PROTOCOL_FORBIDDEN`	The client is explicitly forbidden to access the object and should be informed of this fact.
`PROTOCOL_NOT_FOUND`	The server was unable to locate the item requested.

Table 2-2 (continued) Status Codes Used with protocol_status

Status code	Definition
`PROTOCOL_SERVER_ERROR`	Some sort of server-side error has occurred. Possible causes include misconfiguration, resource unavailability, etc. Any error unrelated to the client generally falls under this rather broad category.
`PROTOCOL_NOT_IMPLEMENTED`	The client has asked the server to perform an action that it knows it cannot do. Generally, this is used to indicate your refusal to implement one of the thousands of less than useful HTTP features.

Error Reporting

When errors occur, it's customary to report them in the server's error log file. To do this, your custom functions should call **log_error**. This logs an error and then returns to tell you if the log was recorded successfully (a return value of **0** means success, **-1** means failure).

```
#include “frame/log.h”

/*
 * log_error formats the arguments with the printf() style fmt.
 * Returns whether the log was successful.
 * It also records the current date.
 * sn and rq are optional parameters. If specified, information
 * about the client is reported.
 */
int log_error(int degree, char *func, Session *sn, Request *rq, char *fmt, ...);
```

You can give **log_error** any **printf()** style string to describe the error. If an error occurs after a system call, use the following function to translate an error number to an error string:

```
#include “base/file.h”

char *system_errmsg(SYS_FILE fd);
```

Note: The **fd** parameter is vestigial under IRIX and might need to be changed for other operating systems.

Conditions for Each Function Class

The following sections list the special conditions that exist in the Request variables and return codes for each class of server function.

AuthTrans

Authorization is split into two steps. First, the authorization data sent by the client (if any) is decoded and verified against internal databases. If the data is valid, it should be stored into the **Request->vars** pblock. In the second step, this data is compared against the required authorization for the requested path (performed in a PathCheck class function).

There is no reason that both of these steps could not be performed in one **AuthTrans** or one **PathCheck** directive; however, the steps are split for flexibility and for supporting the HTTP SSL protocol.

There are no variables active in the **Request->vars** pblock upon entry to an AuthTrans function. Upon successful translation and function exit, the following variables are customarily set:

- **auth-type** identifies the authorization type. Currently, only **basic** is defined for HTTP Basic user authorization.
- **auth-user** gives name of the remote user as verified by internal databases.

Of course, the flexibility of the pblock structure lets AuthTrans functions define their own custom variables that can later be retrieved by the PathCheck function that implements the second step.

Upon return, the AuthTrans function should return REQ_ABORTED if the request is to be aborted, REQ_NOACTION if the translation was unsuccessful, or REQ_PROCEED if successful.

NameTrans

NameTrans class functions are used to translate a virtual path sent by the client into a physical path as used by the server.

The following variables are active in the **Request->vars** pblock for NameTrans functions:

- **ppath** is a partial path. Initially, it is the virtual path given to the server by the client. If other NameTrans functions have modified the ppath, this might be a partially translated path. Your function can change this ppath regardless of the return code.
- **name**, if inserted into the pblock by your function, dictates that the given named object should be added to the set of active objects for this request. The directives in that object will be applied.

Upon return, the REQ return codes have the following meaning:

- REQ_PROCEED: Indicates that a name translation was performed, and that name translation for this object should not continue. This means the server moves to the next directive type in the object in obj.conf (usually PathCheck).
- REQ_ABORTED indicates that the request has encountered an error and that an error message should be sent to the client. No functions are called after your function returns this, except any functions that are designated error handlers.
- REQ_NOACTION indicates that no terminal name translation was applied by your function. This doesn't mean that ppath was not changed. The server continues applying the rest of the object's name translation functions.
- REQ_EXIT indicates that an I/O error occurred while talking with the client. The request should be aborted and no error message should be sent.

PathCheck

PathCheck class functions are used to verify that a given path is safe to return to a given client. This class of functions performs various system-specific URL filtering and screening actions, authorization checks, access control, searches for CGI extra path information, and other functions.

The system only defines one variable for PathCheck functions in **Request->vars**: *path* is the path resulting from the execution of all NameTrans directives. Any variables that have been created by previous NameTrans or AuthTrans directives are also active.

On return, a code other than REQ_ABORTED is considered a success.

ObjectType

ObjectType functions take the path resulting from the previous directives and locate a filesystem object for the path. If none exists and none of the PathCheck directives have looked yet, the current ObjectType routines return an error to the client.

ObjectType directives receive no special variables aside from *path* in **Request->vars** and the variables defined by the previous directives. Upon return, a code other than REQ_ABORTED indicates success.

The server's base functionality library provides mechanisms for typing files natively to the host's operating system. Under most systems, this consists of filename extension recognition code.

Service

Service functions send the server's reply to the client. The function is generally selected by the directory the file resides in or the type of the file being sent. Most files are simply mapped into memory and sent to the client. Some types of documents run as system programs and others are parsed before being sent to the client.

Service directives receive no special variables aside from *path* in **Request->vars** and the variables defined by the previous directives.

The REQ return codes are defined for Service class functions as follows:

- REQ_PROCEED indicates that the response has been sent to the client successfully.
- REQ_NOACTION indicates that the function was not applied. The server should look at the rest of the Service directives.
- REQ_ABORTED indicates that an error has occurred and a message should be sent to the client.
- REQ_EXIT indicates that the connection to the client should end.

The Service class functions need to start the protocol-specific response process for the server. They do this through the following function:

```
int protocol_start_response(Session *sn, Request *rq);
```

If this function returns REQ_NOACTION, then the body response should be skipped and the application function should return successfully. Otherwise, this function returns REQ_PROCEED.

If cross platform considerations are not required, then operating-system specific I/O calls can be made by Service functions.

Initialization Functions

This special class of server application functions initialize static data for the server to use on startup. These functions are called by the base server daemon process, and their data, sockets, or file descriptors are inherited by child processes or threads. This class of function initializes the logging, file typing, and some of the name translation functions.

Init functions receive their parameters just like the other functions, except that the Session and Request parameters are NULL. The parameter **pblock** is filled with information from the server's technical configuration file (*magnus.conf*).

Static data should be limited to read-only data if possible. Other mediums will need to employ some method of locking to ensure that only one process or thread is accessing the data at a time. Unfortunately, there is currently no OS-generic abstraction for this functionality available from the base server code.

Upon failure, custom Init functions should return REQ_ABORTED and insert a variable into their parameter pblock named **error** that contains a string describing the error. Any other return code is considered success.

If the server is restarted, these modules might need to be terminated before they are started again by the server code. For this purpose, the server provides the following function:

```
void magnus_atrestart(void (*fn)(void *), void *data)
```

The given callback **fn** is called by the server when the server is restarted. The data pointer is given to the function as its argument.

Note: Netscape does not call the termination callbacks upon server termination, only upon restart.

Compiling Your Code

This section lists the linking options you need to use in order to create a shared object that the server can load from *magnus.conf*.

Note: See the makefile in the */nsapi/include* directory.

The following table describes the commands used to link object files into a shared object under the various UNIX platforms. In these examples, the compiled object files *t.o* and *u.o* are linked to form a shared object called *test.so*.

Table 2-3 Linking options

System	Compile options
IRIX	ld -shared t.o u.o -o test.so
SunOS	ld -assert pure-text t.o u.o -o test.so
Solaris	ld -G t.o u.o -o test.so
OSF/1	ld -all -shared -expect_unresolved "*" t.o u.o -o test.so
HP-UX	ld -b t.o u.o -o test.so When compiling your code, you must also use the +z flag to the HP C compiler.

For Windows NT, use Microsoft Visual C++ 2.0 to compile a DLL. You must create a file that lists each function you want to export to the server. You also need the file `httpd.lib`, which gives you the locations needed to link your library.

Loading Your Shared Object

After you've compiled your code, you need to tell the server to load the shared object and its functions so that you can begin using your custom functions in *obj.conf*.

When the server starts, it uses *magnus.conf* to get its configuration information. To tell the server to load your shared object and functions in the shared object, you add the following line to *magnus.conf*:

```
Init fn=load-module shlib=[path]filename.so
     funcs="function1,function1,…,functionN"
```

This initialization function opens the given shared object file and loads the functions **function1**, **function2**, and so on. You then use the functions **function1** and **function2** in the server configuration files (either *magnus.conf* or *obj.conf*). Remember to use the functions only with the directives you programmed them for, as described in the following section.

Using Your Custom Functions

This section describes how to use your functions in the server configuration files. All functions are called as follows:

Directive `fn=`*function* `[`*name1=value1*`] ... [`*nameN=valueN*`]`

- *Directive* identifies which class of function is being called. Functions should not be called with the wrong class!
- **fn=***function* identifies the function to be called using the function's *unique* character-string name.

These two parameters are mandatory. After this, there may be an arbitrary number of function-specific parameters, each of which is a name-value pair.

You specify your function using the directive it was written for. For example, the following line uses an AddLog custom function called **myaddlog** that adds an entry to a log file called *mylogfile*. The custom function takes another parameter that defines how much information to log.

```
AddLog fn=myaddlog name="mylogfile" type="maxinfo"
```

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