EMSRV 7.1

Product Development Tools for Smalltalk

Installation and User's Guide

PC and UNIX Platforms

Object Technology International Inc.
2670 Queensview Drive
Ottawa, Ontario
Canada K2B 8K1
voice: (613) 820-1200
fax: (613) 820-1202

This is the EMSRV 7.1 Installation and User's Guide for PC and UNIX Platforms

Document Number: 8271, Revision 7.1
Date printed: January 16, 2001

Table of Contents

1   About This Guide

This book describes how to install and operate the **ENVY***/Developer* library management server (EMSRV) version 7.1 for PC and UNIX platforms. This book also describes the EMADMIN command-line utility.

1.1   Supported Platforms

The various EMSRV implementations have been tested and certified for the following operating systems:

- NetWare®
- Windows ™ NT Workstation and Server
- Windows 2000 Professional, Server and Advanced Server
- OS/2® Warp
- OS/2 Warp Server for e-business
- Solaris®
- HP-UX®
- AIX®
- Red Hat® Linux

The supported platforms may change over time as new releases of servers are tested and patches are received from vendors to fix existing problems. If you have any doubt as to whether a given configuration is supported, refer to the `readme.txt` provided with this product or contact your support representative.

1.2 This Book Includes

This book covers the following topics:

- EMSRV Overview
- Installing and starting EMSRV
- The EMADMIN utility
- Operating EMSRV for NetWare
- Troubleshooting EMSRV as a Windows NT/2000 service
- Frequently Asked Questions

1.3 Who Should Use This Book

This book is intended for network or system administrators who need to install and administer EMSRV.

1.4 Conventions

This book uses the following typographical conventions to distinguish certain items.

Item	Convention	Example
Filename: UNIX; other	`Monotype`. Lowercase for UNIX; uppercase for other	`myfile.h` `MYFILE.INI`
Hint, clarification, comment	Pointer	☞
Keyboard key	SMALL CAPS	ENTER
Keyboard keys to be pressed simultaneously	Plus Sign (+)	CTRL+SHIFT+SPACE
Menu item	**Boldface**	**ENVY > System > Users > Create...**

Messages that appear on screen	`Monotype`	The following error message appears:
		
		`The process terminated`
		`unexpectedly.`

Pathname: UNIX other	`monotype`. Lowercase for UNIX; uppercase for other	`/usr/bin` `\SYS\USER`

Item	Convention	Example
User input	`Monotype`	`User input is in this font`
Variable	**Boldface**	**variable**

1.5   More Information

For information on configuring Smalltalk clients, refer to the **ENVY**/*Developer* Installation Notes.

2   About EMSRV

EMSRV is a database server that permits access to a shared **ENVY***/Manager* library
residing on a remote computer. EMSRV clients communicate with EMSRV using TCP/IP.
Therefore, TCP/IP must be installed and configured on all clients and the server that will
run EMSRV.

Stand-alone clients can access a library directly, but they do so by opening the library in
an exclusive, non-sharing mode, thereby denying access to any other clients. EMSRV
must be used when multiple clients need to access a library simultaneously.

2.1   General Features of EMSRV

EMSRV provides the following features:

* EMSRV is available for popular PC and UNIX operating systems.
* EMSRV for NetWare has a text-based user interface that lets you change settings and
  view statistics. Statistics can be displayed as a total for all connections or per
  connection. You can also delete a connection.
* A command-line utility, EMADMIN, lets you communicate with EMSRV to display
  EMSRV information from a workstation. For a detailed description of EMADMIN,
  refer to Chapter 4, The EMADMIN Utility.
* On UNIX and OS/2 platforms, EMSRV serves each connection with a single process.
  On NetWare and Windows NT/2000 platforms, EMSRV serves each connection with
  a single thread.
* EMSRV uses native locking calls. This exploits locking queues on operating systems
  that implement these services. As a result, performance is increased (network traffic is
  reduced) since EMSRV connections can block at the server-side when waiting on
  locks.

2.2   Client Authentication

2.2.1   Possible Configurations

EMSRV has three configurations for client authentication:

1. Disable password verification. This is the default configuration. It allows clients to impersonate users at will.
2. Specify user IDs and passwords for all users. This option requires the maintenance of a `passwd.dat` file, plus the use of the **-rp** option when starting EMSRV.
3. Use the native operating system user names and passwords for all users. This option requires the use of the **-rn** option when loading EMSRV and does not require a `passwd.dat` file.

☞   Native passwords may be used on all platforms except OS/2.

2.2.2   Using a passwd.dat File

If you intend to maintain **ENVY***/Manager* user IDs separately from native passwords on your site, you must create and maintain a `passwd.dat` file in the EMSRV working directory.

This file contains the logon user IDs of all **ENVY***/Manager* users and their respective passwords for **ENVY***/Manager*. As a security precaution, the **ENVY***/Manager* passwords should not be the users' actual logon passwords. The format of the file is one user ID and password per line, with the user ID first, followed by a single space and then the password.

☞   The `passwd.dat` file should have its rights restricted, so that it cannot be read or written to by regular **ENVY***/Manager* users. If EMSRV is configured correctly, the passwd.dat file will only be readable by the EMSRV user account (NetWare, Windows NT/2000) or the root account (UNIX platforms).

Example of a `password.dat` file:

```
fred mypassword
barney secret
wilma hello
betty ZXF65
```

2.2.3   Authentication on NetWare Platforms

Account names authenticated by EMSRV for NetWare can come from two sources: the name of the EMSRV user and the network names for users managed in an

ENVY*/Manager* library. Account names can be simple or distinguished. Both forms can also be typeful or typeless. Some examples are provided below:

Simple typeless name

```
adrian
```

Simple typeful name

```
CN=adrian
```

Distinguished typeless name

```
adrian.engineering.ral.IBM
```

Distinguished typeful name

```
CN=adrian.OU=engineering.OU=ral.O=IBM
```

Names are always authenticated in the context of the NDS context that is specified when EMSRV is started (the context is appended to the account name). Absolute names (those preceded with a period) are authenticated in the [Root] context; any context specified when EMSRV was started is ignored. For each trailing period in a name, one component of the context is removed before being appended to the name. This allows names to be resolved in containers that are higher in an NDS tree than the specified context. Some examples:

```
Context          engineering.ral.IBM
Name             adrian
Resulting name   adrian.engineering.ral.IBM

Context          engineering.ral.IBM
Name             .admin.IBM
Resulting name   .admin.IBM

Context          engineering.ral.IBM
Name             kathy.support.phx..
Name             kathy.support.phx.IBM
```

By using a distinguished name, it is possible to authenticate users in different containers. The most common case for this may be if the account names for users are located in one container but the EMSRV user is located in another. For example, if NetWare accounts corresponding to network names of users in an **ENVY***/Manager* library exist in the container 'engineering.ral.IBM' but the EMRSV user exists in the container 'IBM', the following command could be used to load EMSRV:

```
load emsrv -u .EMSRV.IBM -p test - W sys:emsrv -rn -SC engineering.ral.IBM
```

Alternatively, the following command would also accomplish the same result:

```
load emsrv -u EMSRV.IBM.. -p test - W sys:emsrv -rn -SC engineering.ral.IBM
```

2.2.4 Authentication on Windows NT/2000 Platforms

Account names authenticated by EMSRV for Windows NT/2000 can come from two
sources: the name of the EMSRV user and the network names for users managed in an
ENVY*/Manager* library. An account name may be in one of three formats:

Simple name

```
adrian
```

Windows NT 4.0 SAM (Security Accounts Manager)-compatible name

```
engineering\adrian
```

User Principal Name (UPN)

```
adrian@ral.ibm.com
```

Windows NT 4.0 and Windows 2000 non-domain controllers support simple names and
SAM-compatible names. Windows 2000 domain controllers support all three formats.
Previous releases of EMSRV for Windows NT only supported simple names. The new
formats allow authentication between domains as well as in an Active Directory.

Windows NT and Windows 2000 support installable authentication and security packages,
allowing the system to be extended with new forms of authentication and security.
EMSRV for Windows NT/2000 supports only the default packages supplied with
Windows NT and Windows 2000—namely, the MSV1_0 and Kerberos authentication
packages and the NTLM (NT LAN Manager) and Kerberos security packages.

2.2.4.1 Authentication Procedure Using Windows NT and Windows 2000 Non-Domain Controllers

EMSRV for Windows NT/2000 uses NTLM (NT Lan Manager) authentication on
Windows NT 4.0 and Windows 2000 non-domain controllers. User records in these
systems are stored in a SAM database.

To authenticate a user, EMSRV must first find the name of the domain with the SAM
database that contains the user to be authenticated. The term *domain* applies equally to
non-domain controllers because every SAM database contains a built-in domain known as
'BUILTIN' as well as (for non-domain controllers) a domain with the same name as the
machine—or for domain controllers, the controlled domain.

If a SAM-compatible name (specifying a domain) is supplied, then the domain is already known. If a simple name is provided, then the following are checked to find the user:

- A list of well-known SIDs (Security Identifiers)
- Built-in and administratively defined local accounts
- The primary domain
- Trusted domains

Once the domain is known, an attempt is made to authenticate the user in that domain.

If the domain name matches the name of the SAM database on the local machine, then the authentication is processed on that machine. The name of the SAM database on a Windows NT Workstation that is a member of a domain is considered to be the name of that Windows NT machine. The name of the SAM database on a Windows NT Advanced Server is the name of the domain. If a Windows NT machine is not a member of a domain, then authentication is processed locally.

If the domain specified is trusted by the domain of the machine running EMSRV, the authentication request is passed through to the trusted domain. On a Windows NT workstation, the request is always passed through to the primary domain controller of the workstation, allowing the primary domain controller to determine if the specified domain is trusted.

If the domain name specified is not trusted by the domain of the machine running EMSRV, the authentication request is processed on that machine as if the domain name specified were that domain (or computer) name. In other words, the domain name is ignored. The system does not differentiate between a nonexistent domain and an untrusted domain.

An example illustrates how cross-domain authentication can be set up:

Example

There are two domains: **KIRA** and **CHIEF**. The domain controller for the **KIRA** domain is NT4PDC. The domain controller for the **CHIEF** domain is NT4PDC2. A trust relationship is set up so that **CHIEF** is a trusted domain of **KIRA** (and hence **KIRA** is a trusting domain of **CHIEF**). The trust relationship is one-way such that **KIRA** is not a trusted domain of **CHIEF**.

EMSRV is set up to run on KIRA\NT4PDC. Users in both domains can be authenticated. Account names may be specified using a simple name, in which case EMSRV will locate the domain containing the user, or else the domain may be specified using a SAM-compatible name such as CHIEF\ADRIAN.

EMSRV is set up to run on CHIEF\NT4PDC2. Only users in the **CHIEF** domain can be authenticated because **KIRA** is not a trusted domain of the **CHIEF** domain.

2.2.4.2   Authentication Procedure Using Windows 2000 Domain Controllers

EMSRV for Windows NT/2000 uses Kerberos authentication on Windows 2000. User records for Windows 2000 domain controllers are stored in an Active Directory instead of a SAM database. The KDC (Key Distribution Center) service must be running to use Kerberos authentication.

If a simple name is supplied, then the procedure for locating the user is the same as that for Windows NT 4.0 and Windows 2000 non-domain controllers. The one difference is that in addition to checking

- a list of well-known SIDs (Security Identifiers),
- built-in and administratively defined local accounts,
- the primary domain, and
- (explicitly) trusted domains,

every domain in the forest for the machine running EMSRV is also checked. This makes sense since a forest is a collection of Active Directory trees connected by two-way transitive trust relationships.

A SAM-compatible name will be authenticated with the domain that the name specifies. A User Principal Name will be authenticated with Active Directory Services.

The implementation of Kerberos authentication in Windows 2000 is already well-documented elsewhere and does not need to be repeated here. In summary:

- The NTLM protocol requires that the server must contact a domain controller.
- When Kerberos is used, the server does not have to contact the domain controller.
- A client gets a ticket for a server by requesting one from a domain controller in the server account domain.
- The server validates the ticket without consulting any other machine.

An example illustrates how Active Directory authentication can be set up:

Example

There are three Active Directory domains: **ibm**, **ral.ibm**, and **engineering.ral.ibm**. The **engineering.ral.ibm** domain is a child of the **ral.ibm** domain, and the **ral.ibm** domain is a child of the **ibm** domain. Each parent-child relationship automatically creates a two-way transitive trust relationship. As a result, since **ral.ibm** trusts **engineering.ral.ibm** and **ibm** trusts **ral.ibm**, **ibm** trusts **engineering.ral.ibm**. The three domains form a tree.

In addition, there is another Active Directory domain: **bedrock**, which forms a tree of one domain. The **ibm** tree and the **bedrock** tree together form a forest; they share a common schema, configuration, global catalog, and are linked with two-way transitive trusts at the tree roots.

Finally there is an NT 4.0 domain—**KIRA**. A one-way trust relationship is set up so that **ibm** trusts **KIRA**.

If EMSRV is run on the domain controller for the **ibm** domain, users from the following domains can be authenticated:

- **ibm**
- **ral.ibm**
- **engineering.ral.ibm**
- **bedrock**
- **KIRA**

Simple names for users in any of those domains will cause a search to be initiated to find the domain containing the user. Alternatively, names may be specified in any one of the other two formats previously described (Windows NT 4.0 SAM-compatible names and User Principal Names).

2.2.5 Authentication on OS/2 Platforms

OS/2 does not support any native authentication method. The only available authentication option is to use a `passwd.dat` file and the **-rp** option when starting EMSRV.

2.2.6 Authentication on UNIX Platforms

2.2.6.1 Traditional Authentication Methods

Most native authentication services on UNIX platforms offer multiple options for configuration. The simplest form of native authentication on UNIX platforms is the local password file (usually `/etc/passwd`) which contains passwords encrypted with a one-way encryption function. Although the passwords cannot be decrypted, the file is

readable by all users of the system and therefore susceptible to dictionary-based password cracking attempts.

The simplest alternative to the local password file is password shadowing. On systems that use NIS/yp or password shadowing, each encrypted password in the /etc/passwd file is replaced with a special token and the passwords are then stored in a separate file that is not readable by normal system users.

2.2.6.2   Authentication Frameworks

Previous releases of EMSRV for UNIX platforms supported local password files and shadow passwords by using two separate EMSRV executables: `emsrv` and `emsrv.shadow`. This was necessary because each authentication system uses a different programming interface.

Recent releases of most UNIX platforms now offer a single authentication programming interface that can support both of the aforementioned authentication systems as well as many others. The most well-known of these authentication frameworks is PAM (Password Authentication Modules). PAM was developed by Sun Microsystems and is now supported by and ships as part of Solaris, Linux, and HP-UX. Although there is no PAM implementation included with AIX, IBM offers a similar **authenticate**() function that can be used to authenticate users using local password files, shadow passwords, and DCE (Distributed Computing Environment) authentication.

A single authentication programming interface makes it possible for one EMSRV executable to use a variety of authentication systems. For this reason, there is no longer an `emsrv.shadow` available on some UNIX platforms. In such cases, the `emsrv` executable can be used to authenticate using shadow passwords and, potentially, other forms of authentication as well.

Although the use of PAM would theoretically allow the use of any PAM (module) with EMSRV by changing the relevant PAM configuration file, in practice this is not possible.

EMSRV does not converse with clients in a manner that is entirely compatible with the PAM architecture. As a result, EMSRV authentication will only work where the module prompts initially for a text password (supplied initially by the client). The tested and certified authentication methods meet these requirements as will most PAM (modules). Sophisticated modules that require extended conversation or authentication data that EMSRV does not support, will not work correctly with EMSRV. Fingerprint scanners and retina scanners are such examples.

Where EMSRV uses an authentication framework such as PAM, the authentication system used by EMSRV and its exact configuration, are determined by the environment. See the relevant section that discusses authentication for the platform on which you will run EMSRV.

2.2.6.3   Usage of Root Access for Authentication

Root access on UNIX platforms is required to authenticate users. EMSRV does *not* need to be started by the root user to accomplish this. Doing so would compromise security as EMSRV would then have complete access to all file systems.

Instead, you should change the owner of the EMSRV executable to 'root' and set the SUID bit of the executable. This can be accomplished as follows:

```
chown root emsrv

chmod u+s emsrv
```

When EMSRV attempts to authenticate a user, it will temporarily change the authority of the running EMSRV process to be the authority of the owner of the executable. Once authentication is complete, the authority of the running EMSRV process will be changed back to that of the user that started EMSRV. This happens on a per-process (per-client) basis so while a client is being authenticated, only the process serving that client has temporary root access.

Root access for authentication is required regardless of how EMSRV actually implements authentication. Interfaces such as PAM provide only a common API to permit applications to support multiple authentication methods; configuration specific to each method of authentication must still be correct.

2.3   File System Support

EMSRV manages libraries to store and retrieve components. Libraries exist as files and are accessed using file-descriptor based I/O and record locking services provided by a file system. To reliably host an **ENVY**/*Manager* library, a file system must be capable of supporting requests from multiple processes for creating, opening, reading, writing, locking, and unlocking files. The operating system/file system must be able to guarantee the delivery and sequence of file I/O requests, ensure integrity of the database when pending writes are flushed or the descriptor to the file is closed, and correctly implement record locking behavior for multiple readers and writers of the same file.

Many operating systems support multiple file systems. Additionally, many operating systems support installable file systems allowing third parties to develop file systems which may then be subsequently installed and accessed transparently by most programs. Although repositories exist simply as files, this does not mean that any file system may host an **ENVY**/*Manager* library accessed by EMSRV. Each release of EMSRV supports a strict set of file systems. The reason for this is simply concern for the integrity of the repository. Historical evidence dictates this, as bugs in operating systems and file systems have sometimes led to repository corruption.

In addition to testing and certifying EMSRV with a strict set of file systems, EMSRV supports only locally-mounted file systems. Remotely-mounted file systems accessed

using network requestors, redirectors, or other similar software cannot always guarantee the integrity of the repository.

Where possible, EMSRV supports all file systems that ship with any release of an operating system. Each file system has a different set of limitations and features. For example, although EMSRV can manage repositories up to 16 GB in size, not all file systems can reliably host a file of this size.

EMSRV will auto-detect a file system where possible and will prevent or warn about accesses to repositories on unsupported file systems. Consult the README.TXT or your technical support representative if you have questions about support for a specific file system.

2.4   National Language Support

When the environment is correctly configured, EMSRV allows clients to store and retrieve file and directory names containing characters other than ASCII.

2.4.1   Character Encoding Between Clients and EMSRV

There are various classes of coded character sets and character encoding schemes in use on platforms supported by EMSRV and EMSRV clients. These fall into various classes including (with examples):

* Single-byte (SBCS) such as ASCII, OEM and ANSI code pages
* Double-byte (DBCS) such as JIS, Shift-JIS
* Multi-byte (MBCS) such as EUC
* Unicode such as UCS-2

On SBCS platforms, EMSRV runs as an SBCS application. On platforms that support DBCS/MBCS, EMSRV runs as a DBCS/MBCS application. This is true even if the operating system and file system both support Unicode. EMSRV is not built as a Unicode application because not all platforms or file systems support Unicode. Although it is possible to encode Unicode as ASCII by using UTF-8 or SCSU, this would increase the length of directory and path names, which already encounter limits on PC platforms.

EMSRV supports non-ASCII characters by using the character-encoding scheme of the client. No character encoding conversions are performed between the client and the server. This means that file and directory names are stored in the server's file system, using the client's encoding scheme. If the client and server use different or incompatible character encoding schemes, file and directory names stored on the server will not match those requested by the client. Even if the server operating system and file system can blindly store any bytes supplied to it, operations may fail as EMSRV may misinterpret trailing bytes of a character as a path separator or other character in which it is interested.

To ensure compatibility between clients and servers, the same or compatible encoding schemes should be used.

The encoding restriction applies only to identifiers that EMSRV must deal with. Data stored in the repository are transparent to EMSRV since it sees only the records containing these data. Unicode clients can freely store components with Unicode names or text in an **ENVY***/Manager* library. However, EMSRV has to deal with directory and path names as well as, when authentication is enabled, user account names. These names are not passed between the client and server as Unicode but are encoded on the client and passed to EMSRV.

An example of a different but compatible character encoding scheme is an English client and a Japanese server using Shift-JIS encoding. If the English client only uses ASCII characters in its file and directory names, the Japanese server can handle these without a problem since US-ASCII is a code subset of Shift-JIS encoding. Introducing a Greek (Windows) client, however, would be problematic since characters with a value >127 in the Greek ANSI code page do not exist in Shift-JIS tables. Likewise, a Japanese (Windows) client using Shift-JIS encoding would not work with a Japanese (UNIX) server using EUC-JP encoding.

In summary, ensure that the clients and servers use the same character-encoding scheme. To check what encoding scheme is being used at a client, run EMADMIN on that machine to check the code page or locale. When started, EMSRV will also report the code page or locale to the console and/or the log, and this information also appears in queries from EMADMIN. Be aware that EMADMIN may not work with EMSRV if run from a machine with a different or incompatible character-encoding scheme than what is being used by the machine running EMSRV.

2.4.2   Code Page Used by EMSRV for NetWare, Windows NT/2000, & OS/2

For NetWare, Windows NT/2000, and OS/2, the code page used by EMSRV is determined by the global settings of the operating system. Usually, this is determined in system settings or startup files.

2.4.3   Locale Used by EMSRV for UNIX Platforms

For UNIX platforms, programs usually run with the 'C' locale by default. If a locale is defined by the environment variable LC_CTYPE (or in the absence of this variable), the environment variable LANG, EMSRV sets the locale of its root process to that defined by the relevant environment variable.

Most platforms set the LANG environment variable when a language is specified in the options for the windowing system login. It is important to note that the environment variable will be inherited only by processes or consoles launched from the windowing system. If EMSRV is launched from a telnet session, for example, the 'C' locale will usually apply.

2.4.4 Platform Restrictions

Although a platform may support MBCS file and directory names, that does not mean that all other identifiers may also be MBCS. EMSRV paths may include drive names or volume names, and authentication also requires user account names. NetWare, for example, supports MBCS file and directory names, but server names and volume names must be SBCS. Consult the documentation for your server operating system to confirm cases where multi-byte characters are legal.

Since EMSRV runs as a DBCS/MBCS application, it will not run on a platform that implements a locale solely using Unicode. Examples of this are the following Windows 2000 locales that do not have code pages:

- Armenian (Armenia)
- Georgian (Georgia)
- Hindi (India)
- Tamil (India)
- Marathi (India)
- Sanskrit (India)
- Konkani (India)

2.4.5 MBCS File & Directory Names on an English NetWare Server

It is important to note that according to Novell, not only do English NetWare servers not support MBCS file or directory names, but that attempting to create such directory entries on an English server could corrupt a volume beyond repair. For details about this, search for TID 2939360 in the Novell Knowledgebase.

2.4.6 EMSRV Messages & Log File Output

Although EMSRV and EMADMIN support the handling of MBCS identifiers, the EMSRV and EMADMIN executables have not been localized. All console and log file output remains in English.

3   Installing EMSRV

3.1   EMSRV for UNIX Operating Systems

3.1.1   Setting up EMSRV for UNIX Operating Systems

Before you start EMSRV for UNIX, perform the following steps:

Step	Action
1	Verify that you are running one of the supported UNIX operating systems.
2	Copy the appropriate program file to the desired directory on the UNIX machine: emsrv or emsrv.shadow ☞ Refer to section 2.2.6, Authentication on UNIX Platforms, for an explanation of when to use emsrv and when to use emsrv.shadow.
3	Ensure that TCP is installed and correctly bound to an Ethernet adapter. You can verify the binding by using the **ping** utility to communicate with the UNIX machine from a workstation on the LAN.

☞   On most UNIX platforms, root privileges are required to authenticate users.
     The best way to achieve this is to configure EMSRV to run with effective root
     privileges rather than starting EMSRV as the root user. This is achieved as
     follows:

     •   Ensure you are logged in as root or have superuser capability. Make sure
         the EMSRV user can read and write the `emsrv` directory:

         ```
         chown <EmsrvUserLoginName>
         ```

         ```
         chmod 755
         ```

     •   Make sure the attributes of the EMSRV executables are as follows:

         ```
         chown root emsrv emsrv.shadow
         ```

         ```
         chmod 4755 emsrv emsrv.shadow
         ```

     With this configuration, EMSRV will ensure the correct file system access by
     running with the privileges of the user who started the most relevant process.
     When it is necessary to authenticate a user, EMSRV will temporarily assume
     effective root privileges and then revert to its previous privileges after
     authentication has been completed.

3.1.1.1   Setting up EMSRV for AIX

On AIX, large file support needs to be enabled for both the volume hosting an
ENVY/*Manager* library and the user starting the EMSRV process.

When creating a file system, ensure that the arguments '`-o bf=true`' are used with `mkfs`.

To set the limits for the user starting the EMSRV process, the **-Hf** and **-Sf** options for the
ulimit command require arguments specifying the number of 512-byte blocks. The
following commands should be appropriate to enable repositories up to 16 GB in size:

```
ulimit -Hf 33554432
```

```
ulimit -Sf unlimited
```

EMSRV for AIX authentication is implemented using the system authenticate() function.
This allows one EMSRV executable to support both shadowed and non-shadowed
passwords in addition to DCE authentication. The authentication method for each user is
set in the `/etc/security/user` file.

3.1.1.2   Setting up EMSRV for Solaris

On Solaris, file systems automatically have large file support, but limits for the user
starting the EMSRV process must still be set. To do this, the **-Hf** and **-Sf** options for the
ulimit command require arguments specifying the number of 512-byte blocks. The
following commands should be appropriate to enable repositories up to 16 GB in size:

```
ulimit -Hf 33554432

ulimit -Sf unlimited
```

With large file support, EMSRV for Solaris supports a maximum repository size of 16 GB on UFS volumes.

EMSRV for Solaris implements authentication using PAM. PAM must be correctly configured on a machine running EMSRV; otherwise, it will not even be possible to shut down EMSRV using EMADMIN. The `/etc/pam.conf` file must detail the 'emsrv' service. An example `pam.conf` file is included with this release.

3.1.1.3   Setting up EMSRV for HP-UX

On HP-UX, large file support needs to be enabled for both the volume hosting an **ENVY***/Manager* library and the user starting the EMSRV process.

When creating a file system, ensure that the argument `'-o largefiles'` is used with newfs.

To set the limits for the user starting the EMSRV process, the **-Hf** and **-Sf** options for the **ulimit** command require arguments specifying the number of 512-byte blocks. The following commands should be appropriate to enable repositories up to 16 GB in size:

```
ulimit -Hf 33554432

ulimit -Sf unlimited
```

With large file support, EMSRV for HP-UX supports a maximum repository size of 16 GB on VxFS volumes.

As of this release, EMSRV for HP-UX does not currently implement authentication using PAM due to a bug in the operating system. See the `README.TXT` file for more information.

3.1.1.4   Setting up EMRSV for Linux

EMSRV for Linux supports a maximum repository size of 2 GB on EXT2FS volumes.

EMSRV for Linux implements authentication using PAM. This allows both shadowed and non-shadowed passwords to be supported with one EMSRV executable. In addition, Red Hat Linux 6.2 supports MD5 passwords, and EMSRV also supports these via PAM.

PAM must be correctly configured on a machine running EMSRV; otherwise, it will not even be possible to shut down EMSRV using EMADMIN. The PAM configuration file must be copied to `/etc/pam.d/emsrv`. A sample PAM configuration file is included with this release.

3.1.2   Starting EMSRV for UNIX Operating Systems

On UNIX platforms, the EMSRV process will have the file access permissions of the UNIX account that starts EMSRV. The UNIX account name that is used to start EMSRV is referred to as the EMSRV account name, and the password for that account is referred to as the EMSRV account password.

Perform the following steps to start EMSRV for UNIX.:

Step	Action
1	Change directory to the directory containing the EMSRV executable (as specified previously in 3.1.1, "Setting up EMSRV for UNIX Operating Systems").
2	Verify that: • The EMSRV user account has appropriate file access rights to the library files. • The library files reside on a local file system. Using EMSRV with library files on remote file systems is not supported. • If the library files reside on hard drives other than the default (boot) drive, make sure you have determined the device numbers using the `emdevnum` utility. These numbers must be included in **-xd** parameters.
3	Determine whether you need to run either `emsrv` or `emsrv.shadow`. Refer to section 2.2.6, Authentication on UNIX Platforms.
4	At the command line, type either `emsrv` or `emsrv.shadow` as appropriate with the desired parameters. Refer to section 3.5, Startup Options.

Example

At the command line, type either:

```
emsrv.shadow -w -lf logfile
```

or

```
emsrv -w -lf logfile
```

Explanation

This command does the following:

• Starts EMSRV with lock tracking turned on.

• Logs messages to the log file with filename `logfile`.

☞   Remember the UNIX account password, as it is needed when shutting down
     EMSRV remotely using EMADMIN.

3.2   EMSRV for Windows NT/2000

3.2.1   Setting up EMSRV for Windows NT/2000

Before you start EMSRV for Windows NT/2000, perform the following steps:

Step	Action
1	Verify that you are running a supported Windows NT/2000 configuration. Refer to the `readme.txt` for more information about supported configurations.
2	Copy the following program file to the desired directory on the Windows NT/2000 machine: `emsrv.exe` Copy the following DLL file to the system directory: `emsrvmsg.dll`
3	Verify that TCP is installed and correctly bound to an Ethernet adapter. You can verify the binding by using the **ping** utility to communicate with the Windows NT/2000 machine from a workstation on the LAN.

EMSRV for Windows NT/2000 requires an existing Windows NT/2000 account to
provide file access restrictions. The Windows NT/2000 account name used by EMSRV is
referred to as the EMSRV account name, and the password for that account is referred to
as the EMSRV account password.

A number of advanced user rights are required for authentication to work correctly.
Authentication is required even if EMSRV is not started with the -rn option since EMSRV
authenticates the EMSRV account when it is started and stopped.

Each of the advanced user rights required for correct EMSRV operation are detailed below.

Act as part of the operating system

This right is required for authentication and must be set for the account from which EMSRV is started (if EMSRV is not started as a service) and the EMSRV account. Note that both accounts must also be part of the 'Administrators' group.

Logon as a service

This right is required if EMSRV is being started as a service and must be set for the account from which EMSRV is started (if EMSRV is not started as a service) and the EMSRV account. You must also ensure that the 'Deny logon as a service' right is not set for each of the accounts.

Logon locally

This right is required if EMSRV is being started interactively or from a batch job and must be set for the account from which EMSRV is started (if EMSRV is not started as a service) and the EMSRV account. You must also ensure that the 'Deny logon locally' right is not set for each of the accounts.

Access this computer from the network

This right is required for each account which will be used to authenticate a client. You must also ensure that the 'Deny access to this computer from the network' right is not set for each account.

As an example, the following table describes how to set and activate the **Act as part of the operating system** right for Windows NT:

Step	Action
1	Log on as Administrator.
2	Run the User Manager utility by clicking **Administrative Tools (Common) > User Manager.**
3	Select the EMSRV user and click **Polices > User Rights**.
4	Click the check box **Show Advanced User Rights**.
5	Select **Act as part of the operating system**.
6	Add the EMSRV user to the list.
7	Log off from the Administrator account and log on again as the EMSRV user.

The following table describes how to set and activate this right in the Local Security Policy for Windows 2000 Professional and Windows 2000 Server.

Step	Action
1	From the Control Panel, double-click **Administrative Tools**.
2	From Administrative Tools, double-click **Local Security Policy**. This opens a *Local Security Settings* window.
3	Double-click **Local Policies**.
4	Select **User Rights Assignment**.
5	In the (right-hand) operating system properties pane, double-click **Act as part of the operating system**.
6	In the *Local Security Policy Setting* dialog, click **Add**.
7	In the *Select Users or Groups* dialog, select the EMSRV user and click **Add**, then click **OK**. The dialog closes, and you are returned to the *Local Security Policy Setting* dialog. The EMSRV user is added to the list, and its **Local Policy Setting** is checked. However, the **Effective Policy Setting** is checked.
8	Click **OK** in the *Local Policy Security Setting* dialog.
9	Log off the Administrator and log back on (as Administrator).
10	To verify, navigate again to the *Local Security Policy Setting* dialog (by repeating Step 1 through Step 5) and ensure that **Effective Policy Setting** is now checked.

☞   For Windows 2000 Server, the **Local Security Policy** may be overridden by the **Domain Controller Security Policy** or the **Domain Security Policy**. User rights for the domain controller and/or domain may need to be set in order for the **Effective Policy Setting** in the **Local Security Policy** to appear checked.

For Windows 2000 Advanced Server, there is no **Local Security Policy**. Assign the right for the **Domain Controller Security Policy** and **Domain Security Policy** as necessary.

Paths to libraries accessed via EMSRV for Windows NT/2000 must be specified as a FAT, FAT32, NTFS, or UNC path, relative to the EMSRV working directory (specified at the command line). It is not possible to access an **ENVY***/Manager* library residing on a remote volume.

Examples of remote volumes include drives residing on other machines, drives shared through Microsoft Networking, and NetWare volumes accessible by the Gateway (and Client) Services for NetWare.

When using EMSRV for Windows NT/2000, long filenames may be created and viewed on FAT, FAT32, and NTFS volumes. Unlike earlier FAT implementations, the Windows NT/2000 FAT implementation has long filename support.

EMSRV for Windows NT/2000 supports a maximum repository size of 2 GB on FAT volumes, 4 GB on FAT32 volumes, and 16 GB on NTFS volumes.

3.2.2 Starting EMSRV for Windows NT/2000

EMSRV for Windows NT/2000 can be started two different ways:

1. From the command line
2. As a Windows NT service

3.2.2.1 Starting EMSRV for Windows NT/2000 from the Command Line

Perform the following steps to start EMSRV for Windows NT/2000 from the command line:

Step	Action
1	Verify that your library files will reside on a local file system. Using EMSRV with library files on remote file systems is not supported.
2	Change directory to the directory containing the EMSRV executable (as specified in 3.2.1, "Setting up EMSRV for Windows NT/2000").
3	At the command line, type emsrv with the desired parameters. Refer to section 3.5, Startup Options.

Example

At the Windows NT/2000 command line type:

```
emsrv -u EMSRVUSER -p swordfish -W d:\path
```

Explanation

This command does the following:

- Loads EMSRV with EMSRV account name "EMSRVUSER" and password "swordfish".

- Sets the working directory to d:\path.

☞   Remember the account password, as it is needed when shutting down EMSRV remotely using EMADMIN.

3.2.2.2   Starting EMSRV for Windows NT/2000 as a Windows NT/2000 Service

The following table describes how to install EMSRV as a Windows NT/2000 service. Refer to Appendix B, Troubleshooting EMSRV as a Windows NT/2000 Service, for a listing of common problems and solutions when running EMSRV as a Windows NT/2000 service:

Step	Action
1	Verify that your library files will reside on a local file system. Using EMSRV with library files on remote file systems is not supported.
2	Copy the `emsrv.exe` file to a local drive on the Windows NT/2000 machine.
3	Open a DOS command prompt and change directory to the location of `emsrv.exe.`
4	Type `emsrv -install [`-parameter list`]`. This installs EMSRV as a service in the Windows NT/2000 registry and copies `emsrvmsg.dll` to the Windows NT/2000 system directory. When EMSRV is started as a service, it will use the startup options specified in the parameter list.
5	Start EMSRV as a service by using one of the following methods described in step 5a or 5b.

Step	Action

5a	**Using the service control panel:**
	
	Steps *i* and *ii* are slightly different for Windows NT and Windows 2000.
	
	i) For Windows NT: Open the Control Panel and double-click the **Services** Control Panel.
	
	     For Windows 2000: Open the Control Panel and double-click the **Administrative Tools** icon.
	
	ii) For Window NT: Select the EMSRV Service in the **Services** Control Panel.
	
	     For Windows 2000: Double-click the **Services** Control Panel.
	
	iii) Click the **Startup Parameters** text box and type:
	
	    `-u <username> -p <password>`
	
	☞ To change the working directory with `-W <workingdirectory>`, you need to enter an extra backslash for each backslash in the path.
	
	Example
	
	`-u fred -p dead -W c:\\library\\testing`
	
	☞ Check **Hardware Profiles** and verify that a configuration is enabled. Enable one if necessary.
	
	d) Click **Start** and EMSRV will start as a service. Clicking **Stop** will stop the service and close all connections.

Step	Action
5b	Starting EMSRV as a service using the Service Controller utility `sc.exe`.
	☞ `sc.exe` is only available as part of the Windows NT/2000 Resource Kit.
	i) Type `sc start -u <username> -p <password>` at the DOS command prompt. ii) Query the service status by typing `sc query emsrv`. To stop the service, type `sc stop emsrv`.
6	To remove the EMSRV Service from the registry, type `emsrv -remove` at the DOS command prompt. Alternatively, it can be removed by typing `sc delete emsrv`.
	☞ The **-remove** option will stop the service if it is running and delete it from the registry. To confirm that EMSRV has been deleted from the registry, double-click the **Services** icon in the Control Panel. EMSRV no longer appears on the list of services.
	WARNING: Removing EMSRV from the registry will also stop EMSRV if it is running. You should not stop EMSRV until all clients have disconnected. Otherwise, developers may not be able to save their images/workspaces.

Guidelines

The following are some guidelines for running EMSRV as a Windows NT/2000 service:

- Run EMSRV from the directory of the executable.
- All necessary EMSRV parameters must be specified when installing EMSRV as a service if you want EMSRV to start automatically when the Windows NT/2000 machine is rebooted.
- The EMSRV service does not need to interact with the Desktop.
- Error messages about startup and low disk space are written to the Windows NT/2000 Event Log.
- The **stop** command will stop the service, closing all active connections without warning.

3.3   EMSRV for NetWare

This section describes how to set up and start EMSRV for NetWare. Refer to Appendix A, Operating EMSRV for NetWare, for information on using EMSRV for NetWare.

3.3.1   Setting up EMSRV for NetWare

Before you load the EMSRV NLM, perform the following steps:

Step	Action
1	From the `readme.txt` file, determine the minimum version of the NetWare operating system NLMs that EMSRV requires. Verify that the versions on your file server are the same as or later than those required. EMSRV requires NDS authentication.
2	Copy the `emsrv.nlm` program file to the `SYS:\SYSTEM` directory on your NetWare file server.
3	Verify that the NetWare TCPIP NLM is loaded and correctly bound to an Ethernet adapter. You can verify the binding by using the **ping** utility to communicate with the NetWare file server from a workstation on the LAN.

4	To ensure that hostnames appear in the EMADMIN output when EMSRV is queried, you must ensure that the resolver is setup correctly to enable reverse DNS lookups. You must ensure that the RESOLV.CFG in SYS:\ETC is setup correctly. An example file would include the following lines:
	
	`domain javadev.com`
	`nameserver 192.168.73.150`

When using EMSRV for NetWare, long filenames may be created and viewed only on NetWare volumes to which the LONG or OS/2 namespace has been added.

EMSRV for NetWare supports a maximum repository size of 4 GB on both NWFS and NSS volumes. See the `README.TXT` for more information about support for libraries larger than 4 GB.

3.3.2   Starting EMSRV for NetWare

The EMSRV NLM logs on to the NetWare file server using an existing NetWare NDS account and password to provide file access restrictions. The NetWare account name used by EMSRV is referred to as the EMSRV account name, and the password for that account is referred to as the EMSRV account password.

When using EMSRV for NetWare, you can optionally set the NDS context using option `-SC <context>`. Please consult your NetWare documentation for information about setting NDS contexts.

When you load the EMSRV NLM, you must supply it with the EMSRV account name, the EMSRV account password, and a working directory. You can supply this information using command-line arguments. If you do not supply this information, the NLM prompts you as it loads.

User names authenticated for the EMSRV account and for clients are interpreted as relative to the NDS context. If an NDS context is not specified, the context will default to `[Root]`.

Perform the following steps to start EMSRV NLM:

Step	Action
1	Change directory to the directory containing the EMSRV executable, `SYS:\SYSTEM` (as specified previously).
2	At the file server console, type `load emsrv` with the desired parameters. Refer to section 3.5, Startup Options.

Example 1

At the file server console type:

```
load emsrv -u EMSRVUSER -p swordfish -W volname:\path
```

Explanation

This command does the following:

- Loads the NLM with the EMSRV account name "EMSRVUSER" and password "swordfish".
- Sets the working directory to `volname:\path`.

Example 2

At the file server console type:

```
load emsrv -u EMSRVUSER -p swordfish -SC ctext -W volname:\path
```

Explanation

This command does the following:

- Sets the EMSRV NDS context to `ctext`.
- Loads the NLM with the EMSRV account name "EMSRVUSER" and password "swordfish".
- Sets the working directory to `volname:\path`.

☞   You can add an appropriate command line to the file server `autoexec.ncf` file, so the NLM loads automatically when the NetWare file server is rebooted.

3.4   EMSRV for OS/2

3.4.1   Setting up EMSRV for OS/2

Before you start EMSRV for OS/2, perform the following steps:

Step	Action
1	Verify that you are running a supported OS/2 configuration.

2	Copy the following program files to the desired directory on the OS/2 computer:
	
	    `emsrv.exe`
	    `emclient.mod`

3	Verify that TCP is installed and is correctly bound to an Ethernet adapter. You can verify the binding by using the **ping** utility to communicate with the OS/2 EMSRV computer from a workstation on the LAN.

When using EMSRV for OS/2, long filenames may be created and viewed on HPFS volumes.

The maximum repository size of volumes on FAT and HPFS volumes is 2 GB.

3.4.2   Starting EMSRV for OS/2

EMSRV for OS/2 does not require a logon account to start. A password may be provided
to protect against unauthorized shutdown.

To start EMSRV for OS/2, perform the following steps:

Step	Action
1	Verify that your library files will reside on a local file system. Using EMSRV with library files on remote file systems is not supported.
2	Change directory to the directory containing the EMSRV executable (as specified previously in 3.4.2, "Starting EMSRV for OS/2").
3	At the OS/2 command line, type emsrv with the desired parameters. Refer to section 3.5, Startup Options.

Example

At the OS/2 command line type:

```
emsrv -p swordfish -W c:\manager -lc
```

Explanation

This command will start EMSRV with working directory `c:\manager` and log
messages to the console.

3.5   Startup Options

The following table lists and describes EMSRV parameters.

Platform Key:

ALL = all platforms	OS/2 = OS/2 Warp	NW = NetWare
NT = Windows NT/2000	UX = UNIX	

Parameter	Platform	Description
-A<0,1>	ALL	The file system requires read locks. The default setting is 0, which indicates the file system does not require read locks. 1 indicates the file system does require read locks.
-a<seconds>	ALL	Sets the number of seconds before a connection with a lock is deemed inactive. The default is 360 seconds.
-b<Kilobytes>	ALL	Sets the low-volume threshold warning in kilobytes. The default is 10,000 kilobytes. If the available disk space is less than the low-volume threshold, EMSRV will log warning messages to the log file.
-f	UX	Sets EMSRV to run in the foreground.
-h	ALL	Displays the help text that lists the valid options.
-i <q,t>	UX	Ignores signals. q = ignore SIGQUIT; t = ignore SIGTERM.
-install	NT	Installs EMSRV as a service.
-lc	NT, NW, OS/2	Logs messages to the console. By default, messages are not written to the console.
-lf<name>	NT, NW, OS/2	Writes the log to file **<name>**. By default, the log is written to emsrv.log. The file **<name>** must specify a valid path for which the EMSRV account has sufficient rights.
-ls	UX	Logs messages to **stdout** instead of a log file. EMSRV must be run in the foreground using the -f option if -ls is used.
-M<numberOf Connections>	ALL	Specifies the maximum number of connections that can be established with EMSRV. The default is 512. To start EMSRV with a maximum of 80 client connections, use the following parameter: `EMSRV -M80`

Parameter	Platform	Description
-P<portNumber>	ALL	Specifies the port number that the EMSRV process uses. The default is 4800. To start EMSRV using port number 4899, use the following parameter: `EMSRV -P4899` ☞ If you need to change the port number on the client, refer to Appendix C:, "Frequently Asked Questions".
-p [password]	NT, NW, OS/2	Specifies the password for the EMSRV user account and restricts library file access. This password is used for EMADMIN functions, such as shutting down EMSRV remotely. Refer to Chapter 4, The EMADMIN Utility for more information on EMADMIN functions. ☞ For NetWare you must specify **-p** without the **password** argument if the EMSRV account has no password.
-R<0,1>	ALL	The file system releases locks on file close. The default setting is 1, which indicates the file system releases locks when a file is closed. 0 indicates the file system does not release locks when a file is closed. If the latter is true, then locks are manually released before closing a library.
-remove	NT	Removes the EMSRV service from the Registry.
-rn	NT, NW, UX	Rejects users who do not supply a valid user name and password matching a user account hosted by the machine where EMSRV is running.
-rp	ALL	Rejects users for whom a matching user name or password is not found in the `passwd.dat` file.

Parameter	Platform	Description
-SC <context>	NW	Sets the NDS context for EMSRV to "context." Consult your NetWare documentation for information on setting NDS contexts.
-s<0, 1, 2>	ALL	Sets the reporting level to the specified severity level (0, 1, or 2). Refer to section 3.7, EMSRV Messages and Reporting for a description of severity levels. The default is 2 (log error messages only) on both PC and UNIX.
-t	ALL	Protects existing files from truncation. By default, files are created over existing ones; that is, the existing file is truncated to 0 length.
-u <username>	NT, NW	Specifies the EMSRV account name to be used. This affects the file permissions and native password-checking abilities of the running EMSRV process.
-W<path>	NT, NW, OS/2	Specifies the EMSRV working directory. The directory **<path>** must be a valid path for which the EMSRV account has sufficient rights to read, write, or both.

3.6   EMSRV and TCP/IP

TCP/IP is the only supported network protocol for EMSRV team development environments.

By default, EMSRV uses port 4800. To change this, use the **-P** parameter when issuing the `emsrv` command. Clients must be configured to use the port that EMSRV will use. Consult the documentation for your client to find out how to do this.

The default limit for client connections to a server is 512. This limit can be changed by using the **-M** parameter of the `emsrv` command. Some TCP/IP stacks will run out of stream sockets before this limit is reached.

EMSRV client/server connections use the TCP keep-alive timer. Some TCP/IP stacks allow the keep-alive timer to be changed. Typically it is 120 minutes. After this time has elapsed, the EMSRV TCP stack sends a keep-alive packet. If the client does not reply, the connection on the server and all its resources are cleaned up.

3.7   EMSRV Messages and Reporting

EMSRV contains comprehensive diagnostics. Based on the specified reporting severity level and whether file logging is enabled, statistics and diagnostic information are logged to the emsrv.log* file and displayed on the console (or on the EMSRV for NetWare Message Screen). All messages with a severity level lower than the current level are suppressed. You can set the level when you start EMSRV, and you can change it dynamically using the EMADMIN utility. The reporting levels are as follows:

Reporting Level	Description
0	Logs all information, warning, and error messages.
1	Logs warning and error messages.
2	Logs only error messages.

☞ When debugging an EMSRV problem, it can be useful to watch the console or Message Screen (NetWare only) as messages are reported. To do this, choose the EMSRV startup options to log to the console and set the appropriate reporting level.

During normal operation, you should set the reporting level to level 2 (log only error messages) because performance is affected when large amounts of information are written to the screen or log file. Set the reporting level to log all operations (reporting level 0) only when you are trying to diagnose a problem.

3.8   Library Pathnames

ENVY*/Manager* libraries must reside on local file systems, relative to the machine where EMSRV is running.

When using **ENVY***/Manager* with EMSRV, all library pathnames are resolved by **ENVY***/Manager* relative to the working directory of the EMSRV process unless a complete operating system-specific path is specified. Typically, no pathname is required because the EMSRV working directory contains the library.

3.9   File Access Rights

EMSRV has the file access rights of the EMSRV account for PC platforms or the account that starts EMSRV under UNIX. This account must have access rights to all directories and files that **ENVY***/Manager* users require. To ensure the integrity of a library, the rights for this file may be restricted to the EMSRV account only.

3.10 File Creation and Ownership

All files created by EMSRV are owned by the EMSRV account (or on UNIX, the user who started EMSRV).

4   The EMADMIN Utility

4.1   Overview

With the EMADMIN command line utility, you can communicate with EMSRV from a workstation. EMADMIN runs on the following platforms:

- Windows 95 and 98
- Windows NT Workstation and Server
- Windows 2000 Professional Server and Advanced Server
- OS/2 Warp
- OS/2 Warp Server for e-business
- HP-UX
- Solaris
- AIX
- Red Hat Linux

If you have any doubt as to whether a given configuration is supported, refer to the `readme.txt` provided with this product or contact your support representative.

4.2   Using EMADMIN

EMADMIN has the following syntax:

`EMADMIN   [command]  [command modifier] [ <host> ] [option]`

Syntax Element	Description
[command]	Refer to section 4.2.1, EMADMIN Commands
[command modifier]	Described in section 4.2.3, Description of Operations which provides descriptions for each individual command
[<host>]	Specifies the hostname or IP address of the server where EMSRV is running
[option]	Described in section 4.2.2, EMADMIN Options

Statistics gathered by EMADMIN can be either displayed on the screen or redirected to a file. For example, to send the list of current connections to `clist.txt`, type:

`EMADMIN list 137.65.2.11 > clist.txt`

4.2.1   EMADMIN Commands

The following table lists and describes EMADMIN commands.

Command	Description
copy	Makes a copy of an **ENVY**/*Manager* library.
help	Displays the valid commands and options.
list	Displays the current EMSRV connection list or information about a specific connection.
opts	Displays the current EMSRV options.
stat	Displays EMSRV statistics.
stop	Shuts down EMSRV remotely or kills an active connection.

4.2.2   EMADMIN Options

-P<portNumber>

Specifies the port that EMSRV is using instead of the default, which is 4800. This option is valid for all EMSRV commands.

4.2.3   Description of Operations

4.2.3.1   Copy (`copy` Command)

This command allows you to copy library files on a single EMSRV or between different EMSRVs running on different machines. The copy command locks the library to ensure that the library cannot be changed while it is being copied.

Notes

- The specified source file must be a valid **ENVY**/*Manager* library file.
- The user must know the EMSRV account password.
- The password characters are not displayed on the screen.
- The library file can be copied only if the correct password has been entered.
- To run the **copy** command in a batch file, the password may be specified as part of the command line. This, in conjunction with the **-q** (quiet) option, ensures that no prompting occurs during the batch process.

Syntax

```
emadmin copy <sourcefile> <destfile> [-p <password>] [-o ] [-q ] [-P<port number>]
```

Parameter	Description
<sourcefile>	A valid **ENVY**/*Manager* library file; the source file will be locked.
<destfile>	File specification must be accessible to the EMSRV user account. An **ENVY**/*Manager* file specification has the following format: <ip_address>:<filename> • **<ip_address>** is optional and specifies the host where EMSRV is running. It can be either the file server IP hostname or its Internet address. If a hostname is not provided, **localhost** is used. • **<filename>** is required and is the file specification.

Command Modifier	Description
-p<password>	This specifies the password to use when the **copy** command is validating access to the source database. The password cannot contain spaces.
-o	The copy command default behavior does not overwrite an existing file. Normally, you are prompted for overwrite permission. The **-o** option specifies that the destination file may be overwritten without prompting for permission.
-q	By default, the **copy** command prints the number of bytes transferred during the copy operation. The **-q** option indicates "quiet operation" and the transfer count is not printed. When this option is enabled, you will not be prompted about potential problems related to low disk space.
-P	This is an optional parameter that specifies the port that EMSRV is using. The default port number is 4800.

Example

To copy a library file to a backup file, enter the following command:

```
emadmin copy 192.168.33.20:manager.dat 192.168.33.20:test.dat -o
-psecret -q
```

Explanation

This example copies (in quiet mode) manager.dat to test.dat in the working directory, overwriting test.dat if it exists and using the password "secret" to access the source library.

4.2.3.2   List Current Connections (`list` Command)

The **list** command lists current connections for EMSRV. This command sends a message to the host running EMSRV and requests the list of connections. Information about connection statistics and active locks can be obtained using the **list** command modifiers.

☞   To verify that all clients are disconnected, use the list operation before stopping EMSRV.

Syntax

EMADMIN list[command modifiers][<host>] [-P<port number>]

Command Modifier	Description
-s[<connection number>]	Display the statistics for the connection specified by connection number.
-l[<connection number>]	Display the active locks for the connection specified by connection number.

Example

```
emadmin list syd3f
```

Output

```
EMADMIN 7.0
Copyright (C) IBM Corporation 1989-2000
Code page (ANSI): 1252

==============================================================================
EMSRV 7.1 for NetWare (NDS) Dec 07 2000 13:18:27 (EST)
Operating system: NetWare 5.09 (SMP) (1 Processor - 2048 MB Memory)
Code page: 437

                        Active  Last
 ID IP Address          Locks   Request  Socket  File
--------------------------------------------------------------------------
0 204.138.97.188   0       13:22:09     13   DATA:\uvm\manager\manager6.dat
1 204.138.97.188   0       13:21:51     18   DATA:\uvm\manager\manager6.dat
2 204.138.97.188   0       13:21:51     22   <none>
3 204.138.97.18    0       15:31:31     27   DATA:\uvm\manager\manager6.dat
4 204.138.97.18    0       15:30:51     32   DATA:\uvm\manager\manager6.dat
5 204.138.97.18    0       15:30:51     36   <none>
6 192.168.12.21    0       16:34:26     41   DATA:\uvm\manager\manager6.dat
7 192.168.12.21    0       16:34:26     46   DATA:\uvm\manager\manager6.dat
8 192.168.12.21    0       16:34:08     50   <none>
--------------------------------------------------------------------------

There are 9 active connections.
==============================================================================
```

Example

```
emadmin list -s0 syd3f
```

Output

```
EMADMIN 7.0
Copyright (C) IBM Corporation 1989-2000
Code page (ANSI): 1252

================================================================================
EMSRV 7.1 for NetWare (NDS) Dec 07 2000 13:18:27 (EST)
Operating system: NetWare 5.09 (SMP) (1 Processor - 2048 MB Memory)
Code page: 437

Connection 0 statistics (204.138.97.188)

File: DATA:\uvm\manager\manager6.dat
Total Opens:                   2  Total Closes:              1
Total Reads:                  27  Total Writes:              0
Total Locks:                   0  Total Unlocks:             0
Current Locks:                 0
```

4.2.3.3   Display EMSRV Options (`opts` Command)

The **opts** command allows you to display the current options for EMSRV.

Syntax

```
emadmin opts <host>[-s<level>] [-P<port number>]
```

Parameter	Description
-s\<level\>	Specifies a new logging level for EMSRV. This command allows you to change the current logging level without having to access the machine where EMSRV is running. You can specify the following logging levels:
	0 Logs all operations and messages to the log file.
	1 Logs warnings and errors to the log file.
	2 Logs only errors to the log file (default).

Example

```
emadmin opts syd3f -s2 -p bigdog
```

Output

```
EMADMIN 7.0
Copyright (C) IBM Corporation 1989-2000
Code page (ANSI): 1252
Logging level set to [Error].
```

Example

```
emadmin opts syd3f
```

Output

```
EMADMIN 7.0
Copyright (C) IBM Corporation 1989-2000
Code page (ANSI): 1252

===============================================================================
EMSRV 7.1 for NetWare (NDS) Dec 07 2000 13:18:27 (EST)
Operating system: NetWare 5.09 (SMP) (1 Processor - 2048 MB Memory)
Code page: 437

Maximum number of concurrent connections: 512
Working directory: DATA:EMSRV
Authentication: Disabled

Logging level: Error
Log file name: emsrv.log

Allow connection to truncate repositories: Yes
Process activity timeout value: 30 sec
Sleep on lock value: 1000 ms
Free disk space warning threshold: 10000 KB
Restrict repositories to local filesystems: No
===============================================================================
```

4.2.3.4   Display Current EMSRV Statistics (`stat` Command)

The **stat** command displays the statistics for EMSRV. It sends a message to a host running
EMSRV and requests a copy of the latest statistics. This command provides information
such as numbers of file opens, closes, and writes.

Syntax

```
emadmin stat <host> [-P<port number>]
```

Example

```
emadmin stat syd3f
```

Output

```
EMADMIN 7.0
Copyright (C) IBM Corporation 1989-2000
Code page (ANSI): 1252


==============================================================================
EMSRV 7.1 for NetWare (NDS) Dec 07 2000 13:18:27 (EST)
Operating system: NetWare 5.09 (SMP) (1 Processor - 2048 MB Memory)
Code page: 437

Total Connects:              234     Total Disconnects:           226
Total Opens:                 7633    Total Closes:                7613
Active Locks                 0       Unexpected Connection Closes: 29
Total Locks:                 141795  Total Unlocks:               141795
Total Reads:                 293743  Total Writes:                101530
Total Reads Failed On Lock: 0        Total Locks Failed On Lock:  0
Times Lock Limit Hit:        0
Total Requests Serviced:     5144671 Requests in last interval:   1528
Largest Packet Sent:         32780   Largest Packet Received:     32784

Working Directory : DATA:EMSRV
Server Has Been Alive For: 4 Days 23 Hours 42 Minutes 45 Seconds
==============================================================================
```

4.2.3.5 Terminate a Connection (`stop -k [connection number]`)

This command is used to close a connection to EMSRV. It can be used to terminate a
connection that can no longer communicate with the client. Use the **list** command to
obtain the list of connections that can be closed and its respective connection numbers.

Syntax

emadmin stop <server_address>-k<connection_number>

Parameter	Description
<server_address>	This optional parameter specifies the host where EMSRV is running. The parameter can be either the server hostname or its Internet address. If a hostname is not provided, **localhost** is used.
<connection_number>	This required parameter is the unique connection number of the connection to be terminated.

Example

```
emadmin stop -k11 syd3f
```

4.2.3.6   Shutting Down EMSRV Remotely or Killing Connections (`stop` Command)

The **stop** command shuts down EMSRV remotely. When you use this operation, you are prompted for the EMSRV account password. The password characters are not displayed on the screen. EMSRV can be shut down only if you have entered the correct password.

Syntax

emadmin stop [host] [-P<port number>]

Example

```
emadmin stop syd3f
```

4.3   Limitations

Refer to the `readme.txt` provided with this product for information about any known problems.

4.3.1   Performance on Low-Bandwidth, High-Latency Network Connections

The protocol used between EMSRV clients and EMSRV generally results in a high rate of packets transmitting to the server. This is because a large majority of the processing is done at the client as opposed to the server. The majority of requests processed by EMSRV are I/O requests (e.g., record lock, read and write requests).

As a result of this architecture, performance experienced at the client end is highly sensitive to the latency of the network. Latency (measured by round-trip or "ping" packet times) of less than 5 ms is expected to produce acceptable performance. LAN latency is generally less than 1 ms, but a WAN connection or dial-up modem connection on a telephone line may have a latency as high as 500 ms. Even with high-speed DSL, cable, frame relay, or ISDN connections, the latency is a function of the distance between two endpoints.

In general, performance on a dial-up modem connection across a telephone line yields unacceptable performance as connections of that type typically have a latency of 200 ms or more. High-speed connections also yield unacceptable performance unless the distance between the client and the server is a few hundred kilometers or less. The EMSRV

protocol is not particularly bandwidth-intensive, but bandwidth usage is a function of the number of clients simultaneously using a connection.

4.3.2   TCP/IP Connection Limitations

The default limit for client connections to an EMSRV is 512. This limit can be changed using the -M command-line option when you start EMSRV.

The number is bounded primarily by memory, but some TCP/IP stacks will run out of stream sockets before the limit of memory is reached. Typically, this number is greater than one hundred, but it varies with each stack.

4.3.3   Detecting Unexpectedly Dropped Connections

EMSRV uses the TCP/IP KEEPALIVE timer to detect connections which have been unexpectedly dropped when a client has crashed or been rebooted. Some TCP/IP stacks allow the KEEPALIVE timeout to be changed. Typically, the default setting is 120 minutes.

EMADMIN may be used to list the connections and identify a connection that has not interacted with the server for a long time by the time of the last request. Such a connection may then be closed using the EMADMIN STOP command and the **-k** option.

Appendix A: Operating EMSRV for NetWare

Console Screens

EMSRV creates two console screens:

- The Menu Screen, which is used to observe and change EMSRV settings.
- The Message Screen, which displays log messages according to the specified reporting level.

☞   Context-sensitive help can be viewed at any time by pressing F1.

Menu Choices

The following operations are available from the Menu Screen:

- Change settings
- View connections
- View the message screen
- View EMSRV statistics
- Shut down EMSRV

Changing Settings

Selecting **Change Settings** causes an editable form to display. To exit the form and save (and implement) the changes, press ESC.

The following table describes each form field and lists the corresponding startup option, if one exists, as well as the default value.

Field	Description	Startup Option (*Default*)
Maximum Number of Connections	Displays the maximum number of connections allowed by EMSRV.	-w (*default*: 256)
Logging Level	Displays the current reporting level. To change the reporting level, press ENTER to access a pop-up menu.	-s0 (logs all operations) -s1 (logs warning and error messages) -s2 (*default*: logs only error messages)
Log to a File	Specifies whether EMSRV logs to a file of specified name.	-lf <filename>
Allow Libraries to be Truncated	Specifies whether users are allowed to truncate existing libraries.	-t (*default*: yes)
Client Password Verification	Specifies whether client password verification is disabled, whether native NetWare passwords are used, and whether the passwd.dat file is used. To change the style of password verification, press ENTER to access a pop-up menu.	-rn (rejects users who do not supply a valid NetWare user name and password) -rd (*default*: disables password checking for clients) -rp (rejects users who are not in the passwd.dat file)
Statistics Recorded per Screen Update	Specifies the number of statistics that must change before EMSRV updates its statistics screen. The higher this number is, the better the EMSRV performance.	(*default*: 1000)

Viewing Connections

Select **View Connections** to display a list of client connections. Scroll through the list to select a specific connection. After selecting a connection:

•   Press ENTER to display its statistics.
•   Press DELETE to terminate the connection.
•   Press ESC to return to the menu.

To display EMSRV statistics, select EMSRV Statistics from the Menu Screen.

Viewing the Message Screen

To display the Message Screen, select **View Message Screen** from the Menu Screen. To return to the Menu Screen, press ESC.

Viewing EMSRV Statistics

Select **EMSRV Statistics** from the Menu Screen to display EMSRV statistics that have been accumulated since the EMSRV NLM was started.

☞   Typically, EMSRV statistics are displayed after displaying connection statistics using View Connection List.

   To force a screen update while the EMSRV statistics are currently displayed, select EMSRV Statistics.

EMSRV for NetWare Messages and Reporting

To change the reporting level from the NetWare console while EMSRV is running:

1.   Select **Change Settings** from the Menu Screen.
2.   Select **Reporting Level**.
3.   Press ENTER.

☞   When debugging an EMSRV problem, it is often useful to watch the write operations to the Message Screen as they occur. To do this, switch to the Message Screen after setting the reporting level.

Shutting Down EMSRV

EMSRV for NetWare cannot be unloaded using the unload command at the file server console. It can only be unloaded from the Menu Screen or by running EMADMIN. (For information on using EMADMIN, see Chapter 4, The EMADMIN Utility

Do not unload EMSRV for NetWare if users are still connected. If library transactions are in progress when ENSRV is unloaded, the library may be left in an inconsistent state.

The following table describes how to safely unload EMSRV.

Step	Action
1	Verify that all **ENVY***/Manager* users who were connected to EMSRV have disconnected. To verify this, select **View Connection List** from the Menu Screen or use emadmin.
2	If there are connections, terminate them by selecting **View Connection List** from the Menu Screen and pressing ESC.
3	Unload the EMSRV NLM by using emadmin or the Menu Screen. From the Menu Screen, select **Shutdown EMSRV** to shut down and unload the EMSRV NLM. The EMSRV account password must be entered before EMSRV will unload.

Appendix B: Troubleshooting EMSRV as a Windows NT/2000 Service

This section describes and provides solutions for common problems when running EMSRV as a Windows NT/2000 service.

Problem	Solution
`An internal Windows NT/2000 error has occurred` error message appears at startup.	Open the Service Control Panel. Verify that the startup parameters are entered correctly and that the user name is a valid user on the server. The **-u** option is always needed to start the server.
Normal EMSRV (not a service) hangs on startup.	A pathname cannot be specified for the executable in Windows NT/2000. It must be run in the directory of the executable. It will not run from a different directory.
`The specific service is disabled and cannot be started` error message appears at startup.	For Windows NT: From the Control Panel, click **Services**, then click the **HW Profiles** button. Select the **Original Configuration**. If its status is disabled, enable it by clicking the **Enable** button. For Windows 2000: From the Control Panel, double-click the **Administrative Tools** icon, then click the **HW Profiles** button. Select the **Original Configuration**. If its status is disabled, enable it by clicking the **Enable** button.
The start button is disabled.	The service could already be running on the local machine. Otherwise, the service could be disabled. For Windows NT: Select **EMSRV Service** in the Service Control Panel. Click **Startup** to open the Startup Options window. Select **Manual** for Startup Type. For Windows 2000: Open the Control Panel and double-click the **Administrative Tools** icon. Double-click on the **Services Control** Panel. Click **Startup** to open the Startup Options window. Select **Manual** for Startup Type.

Problem	Solution
`The service did not start due to a logon failure` error message appears at startup.	An invalid password was entered in the Startup Window of the Service Control Panel. Open the Startup Window and change the password or start as the System Account.
`The process terminated unexpectedly` error message appears at startup.	EMSRV could already be running in normal mode (i.e., not as a service) on the local machine. This instance must be stopped for EMSRV to run as a service.

Appendix C: Frequently Asked Questions

Q1: How do I set up EMSRV and clients to use a TCP port other than the default (4800)?

A1: First, start EMSRV using the -P option to specify a different port number for the EMSRV listening socket. For example:

```
emsrv -P4803
```

The running EMSRV process will listen for connections on port 4803 instead of the default port 4800.

Second, in the `ENVY.CNF`, `ABT.INI`, or `IDE.INI` files, wherever the IP address or hostname of the server is mentioned, a TCP port can be specified by adding the port number after a single colon (:) appended to the IP address or hostname. Examples of this are:

```
server3:4803
```

```
192.168.7.50:4803
```

Third, when using EMADMIN to connect to an EMSRV listening on a TCP port other the default (4800), specify the -P option and the port number. Example:

```
emadmin list server3 -P4803
```

Q2: Can more than one library exist on the same server and be serviced by the same EMSRV process?

A2: Yes. In fact, when importing components between two libraries on the same machine using the same EMSRV, that EMSRV is servicing requests to both of those libraries simultaneously.

Q3: Can more than one EMSRV process be run on the same server?

A3: This is definitely not supported on some platforms (specifically NetWare, Windows NT/2000 and OS/2) and has not been tested on the others. Since EMSRV listens on a default port of 4800, it is necessary to ensure that a different port number is used for each EMSRV (and the corresponding clients), assuming that it worked. This is not a recommended configuration, and there is nothing to be gained from it.

Q4: How many clients can a single running EMSRV process support?

There is no simple answer to this question. First, EMSRV is a network and file I/O-intensive server application and should, therefore, be run on a server-class machine as opposed to a workstation. Second, the running EMSRV is realistically measured in the number of I/O requests serviced per second (almost all requests are I/O requests). This is usually a function of the number of connections (as opposed to the number of clients). Usually, each client maintains one connection; however, when exporting to and from the same EMSRV process, a single client will have two concurrent connections to that same EMSRV. Exporting is seen by EMSRV as an almost continual stream of I/O requests on both the source and destination connections and is one of the most intensive activities that can be performed against an EMSRV process. Normal development-which involves reading and writing records in the library as a result of browsing and writing code and loading components from the library-results in a lot of idle time on a connection. Loading produces a lot of I/O read requests, but operations such as saving a method (which is usually not performed continuously in quick succession) are easily and quickly serviced.

Considering all of that, any server-class machine should have no trouble supporting 50-60 clients.

Q5: How can I improve performance?

I have a very large number of clients who need to concurrently use the same EMSRV process.

or,

My current EMSRV is simply too slow.

A5: EMSRV is not a CPU-intensive operation, and, therefore, a faster CPU does not make much difference at all. NetWare servers running on 486s or low-end Pentium chips such as a Pentium 100 or 120 have no problem supporting up to 100 connections if they have decent server-class I/O hardware. A brief description of some of the hardware factors affecting EMSRV performance are as follows:

Network:

In heavy-load environments, there is a measurable difference between network interface cards (NICs) optimized for servers and those for workstations. The server's network connection should provide for as much bandwidth as possible. Simple ways to do this are:

a. If the machine hosting the EMSRV process is also used for other purposes (i.e., general file serving), then multiple NICs should be used with appropriate packet routing so that a single NIC is dedicated to EMSRV usage. For example, for NetWare servers, one NIC can be used to service IPX traffic, and another NIC can be used for TCP/IP traffic. If TCP/IP is used for applications other than EMSRV, the server can be multi-homed (multiple IP addresses) such that an IP is bound to multiple NICs, and

each NIC has a different IP address, and EMSRV traffic is assigned to a dedicated IP address.

b. Use a switched (full-duplex) connection. With a shared Ethernet connection, when the server is trying to transmit on the wire and encountering collisions, it cannot be receiving (since it is waiting to retransmit). The end result of this is that all clients waiting to send to the machine are delayed since a shared connection can only either transmit or receive. Full-duplex connections can simultaneously transmit and receive and will improve performance significantly where a large number of clients is present.

c. Use a large bandwidth network connection such as Fast Ethernet or Gigabit Ethernet.

d. Many of the high-end server NICs can be aggregated (multiple NICs appearing to be one NIC). There are also cards from vendors such as Adaptec that have multiple network connections on the one card.

Disk:

The very fastest disks possible disks should be used (e.g., Fast-Wide or Ultra or Ultra-2 SCSI disks with a rotation speed of at least 7200 rpm or, if possible, 10,000 rpm). If ATA drives must be used, then use an Ultra-DMA drive and choose one of the newer 7200 rpm ATA drives.

About duplexing (mirrored disks on separate SCSI channels): There is no penalty for writes. However, reads (which are by far the bulk of I/O requests serviced by EMSRV) are much faster since they are scattered on separate channels. Simple mirroring using separate disks on the same SCSI channel results in a penalty for writes. Duplexing or mirroring, as well as other RAID configurations such as RAID 5, have the additional benefits of increased data redundancy.

About disk striping (striping volumes across multiple disks): The danger of this is that if one disk fails, then the entire volume is unavailable. Combined striping and redundancy schemes such as RAID 5 are expensive but provide the benefits of striping with a redundancy scheme as well.

Dedicated I/O subsystems:

There are dedicated intelligent I/O subsystems, such as Intel's new I2O, which is supported in NetWare 5. Although EMSRV is not very CPU-intensive, when a low-end CPU is used (i.e., a Pentium) in a very heavily-loaded environment, a bottleneck may result.

Q6: How do additional memory versus faster processors affect EMSRV performance?

A6: The most important issue is the ability of the OS to multi-task (context switch, avoid thread or process starvation, and block on I/O without consuming CPU cycles). As long as the OS is not swapping, the memory will be sufficient since EMSRV does not use any additional memory for caching, etc. as a network file system might do. EMSRV does not use much processor time. The main bottlenecks are all I/O-related.

Q7: Given the same hardware, is EMSRV equivalent in load-capability on the different operating systems? In other words, does EMSRV run faster on some operating systems?

A7: The main issue is threads versus processes, which affects scalability (how performance degrades as the load increases). As of EMSRV 7.1, only the NetWare and Windows NT/2000 versions of EMSRV use one thread per connection.   On all other platforms, one process per connection is used. Fortunately, EMSRV connections are usually long-lived, and there is not the type of continuous connection and disconnection in, for example, a web server using HTTP 1.0. This means that the slowness of forking processes on some platforms is not a great issue.

Q8: Most of the operating systems supported by EMSRV have threads, so why does EMSRV only use threads on Windows NT/2000 and NetWare?

A8: Although most operating systems now support threads in the OS kernel, only some (currently only NetWare and Windows NT/2000) manage file system locks on a per-thread basis. Current releases of EMSRV have been implemented in such a way that it relies on the operating system to manage locking rather than maintain our own locking tables. This is the most efficient approach since OS calls can block when encountering a locked region and will also queue multiple lock requesters.

Index

A
Access rights, file 36
authentication 12

B
backing up files. See copy command

C
Changing settings, NetWare 49–50
clients 56
clients, large number of 56
Commands for EMADMIN 39
Connection statistics, list command 41
copy command 39, 40

D
Dedicated I/O subsystems 57
Diagnostics. See Reporting
Disabling password verification 7
Disk 57

E
EMADMIN
    commands 39
    overview 38
    port options 39
    reporting, severity level 36
    supported platforms 38
    syntax 39
emdevnum 21
Enabling password verification 7

F
File
    access rights 36
    creation 37
    ownership 37
file system support 14
Frequently asked questions 55

H
hardware 57
help command 39

I
Installation
    NetWare 29
    UNIX 18
    Windows NT/2000 22

L
libraries 55
Library pathnames 36
Limitations 47
    detecting dropped connections 48
    no WAN support 47
    TCP/IP connection 48
list command 39, 41
load-capability 57

M
memory 57
Messages. See Reporting
multiple libraries 55
multiple processes 55

N
Native locking calls 7
NetWare
    changing settings 49–50
    console screens 49
    installation 29
    menu choices 49
    shutting down EMSRV 51
    viewing connections 51
    viewing messages 51
    viewing statistics 51
Network 56
NT. See Windows NT/2000