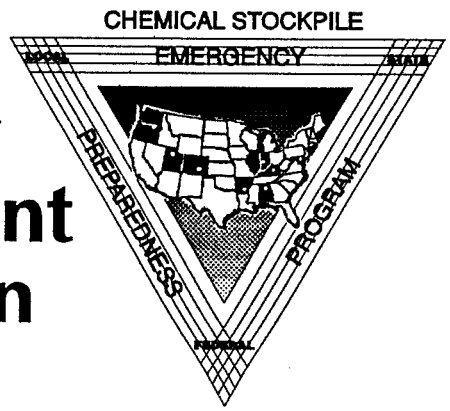
PNL-10610 Ver. 1.3
UC-620

Federal Emergency Management Information System (FEMIS)

System Administration Guide

Version 1.3

Federal Emergency Management Information System



December 1996

Prepared for the CSEPP Office
United States Army Chemical
and Biological Defense Command
under a Related Services Agreement
with the U.S. Department of Energy
Contract DE-AC06-76RLO 1830

Pacific Northwest National Laboratory
Operated for the U.S. Department of Energy
by Battelle Memorial Institute

ACKNOWLEDGMENT

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SOFTWARE PRODUCTS

FEMIS integrates the following commercial software products. These products are trademarks or trade names of their respective owners.

Arc/Info® and ArcView® Environmental Systems Research Institute, Inc.

NFS Maestro™ Hummingbird Communications Ltd.

GroupWise™ Novell Inc.

Microsoft® Excel for Windows™, Microsoft® Project for Windows™, Microsoft® PowerPoint™, and Microsoft® Visual Basic™ Microsoft Corporation

Oracle7®, SQL*Net®, PRO*C, and PRO*FORTRAN® Oracle Corporation

Solaris™ SunSoft

UNIX™ UNIX System Laboratories

WordPerfect® for Windows WordPerfect Corporation.

FEMIS integrates the following government-furnished software products.

D2PC (April 1996) US Army ERDEC
PARDOS v3.1 US Army ERDEC
Evacuation SIMulation Model (ESIM v2.5B) Oak Ridge National Laboratories

Martin Hall et al. January 20, 1993. *Windows Sockets, An Open Interface for Network Programming under Microsoft® Windows™, Version 1.1.* Available on CompuServe and by anonymous FTP on rhino.microsoft.com and microdyne.com.

PNL-10610 Ver 1.3
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FEDERAL EMERGENCY MANAGEMENT INFORMATION SYSTEM (FEMIS)

SYSTEM ADMINISTRATION GUIDE

Version 1.3

MJ Burford
RA Burnett
TR Downing
KL Gaustad
PM Fangman
LH Gerhardstein
RL Johnson
SM Johnson
RM Loveall
TJ Martin
WD Millard
LR Stoops
S Tzemos
JR Williams
C Winters
BM Woods

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Pacific Northwest National Laboratory
Richland, Washington 99352

DISCLAIMER

Preface

The Federal Emergency Management System (FEMIS) is an emergency management planning and analysis tool. The following documents were developed to support system users. The audience for each is identified.

The *FEMIS System Administration Guide* defines FEMIS hardware and software requirements and gives instructions for installing the FEMIS software package. **Audience:** system administrators and system managers.

This *FEMIS Data Management Guide* provides the information needed to manage the data files and database used to support the administrative, user-environment, database management, and operational capabilities of the FEMIS. **Audience:** chiefly database administrators and system administrators but also emergency management planners and analysts who want to know details of the emergency management data.

The *FEMIS Online Help System* explains how to start and use the FEMIS client software, which is designed to help civilian emergency management personnel to plan for and support their responses to a chemical-releasing event at a military chemical stockpile.[a] **Audience:** all users of FEMIS, especially emergency management planners and analysts.

(a) The FEMIS product is being developed by the Pacific Northwest National Laboratory as part of the U.S. Army's Chemical Stockpile Emergency Preparedness Program (CSEPP). Pacific Northwest National Laboratory is operated for the U.S. Department of Energy by Battelle Memorial Institute under Contract DE-AC06-76RLO 1830.

About This Guide

Purpose

The Federal Emergency Management Information System (FEMIS) is an emergency management planning and analysis tool that is being developed under the direction of the U.S. Army Chemical Biological Defense Command. The ***FEMIS System Administration Guide*** defines FEMIS hardware and software requirements and gives instructions for installing the FEMIS system package.

Scope

System administrators, database administrators, and general users can use this guide to install, configure, and maintain the FEMIS client software package. This document provides a description of the FEMIS environment; data, communications, and electronic mail servers; user workstations; and system management.

We encourage you contact us with suggestions or to ask questions. You can contact us by mail, telephone, fax, or E-mail:

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Audience

This guide is addressed to system administrators and managers. Users of this guide are expected to be familiar with the ***FEMIS Database Management Guide*** and with the FEMIS software.

Prerequisites

This guide assumes the system administrators have some knowledge of the UNIX operating system. Additional training may be required to understand the multi-server distributed data architecture of FEMIS. A complete set of UNIX and Commercial-Off-The-Shelf (COTS) software documentation should be available to the System Administrator.

Organization

This document is organized into seventeen sections, which include details on the description, installation, configuration, utilities, and troubleshooting of FEMIS.

Section 1.0 - Overview - discusses the FEMIS software package, environment, administration, and directory structures.

Section 2.0 - FEMIS UNIX Installation - describes installing the UNIX-based COTS software, installing the FEMIS UNIX software, and creating the FEMIS database.

Section 3.0 - FEMIS PC Installation - discusses the installation, configuration, and validation of the FEMIS application on client PCs.

Section 4.0 FEMIS Monitoring Tools - describes how to use the FEMIS monitoring tools to check the status of database replication and the system.

Section 5.0 FEMIS Notification Service - describes the FEMIS Notification Service that each FEMIS PC uses to coordinate activities and data.

Section 6.0 - FEMIS Command Server - describes the FEMIS Command Service and how PC users can launch large mathematical model/simulation codes.

Section 7.0 - FEMIS Met Application Suite - describes the FEMIS Met applications and their uses.

Section 8.0 - FEMIS Data Exchange Interface (DEI) - discusses the FEMIS Data Exchange Interface application, which is used to support the transfer of data from Emergency Management Information System (EMIS) to FEMIS.

Section 9.0 - FEMIS GIS Database - describes the FEMIS geographic information system (GIS) database and the components of the spatial database.

Section 10.0 - FEMIS Oracle Database - describes the FEMIS Oracle database, which includes managing the relational database and replication.

Section 11.0 - FEMIS Evacuation Applications - describes the FEMIS evacuation interface.

Section 12.0 - Electronic Mail Service - discusses the electronic mail service, such as accessing position mailboxes, tips for using the Novell GroupWise Notify, and GroupWise security.

Section 13.0 - FEMIS PC Workstations -- describes how the PC-based user interface and services provide a variety of functions necessary for managing an emergency, including the COTS software.

Section 14.0 - FEMIS UNIX Server - discusses the maintenance, backup procedures, and troubleshooting for the FEMIS UNIX server.

Section 15.0 - System Management - describes the system authorization to validate user authorities and the system administration utilities provided to define and modify user accounts, maintain the site profiles, and clear locks on databases.

Section 16.0 - FEMIS PC Utilities - describes the utilities available with the FEMIS applications.

Section 17.0 - Troubleshooting - discusses error messages and problems as well as methods to resolve these issues.

Appendix A - FEMIS Checklist for UNIX Servers - is provided for monitoring the FEMIS UNIX servers during daily usage.

Contents

Acronyms and Definitions

COTS	Commercial-Off-The-Shelf
CPU	Central Processing Unit
CSEPP	Chemical Stockpile Emergency Preparedness Program
CTOO	Name of a FEMIS database (Tooele County)
DBMS	Database Management System
DEI	Data Exchange Interface
DLL	Dynamic Linked Library
DNS	Domain Name Services
E-mail	Electronic Mail
EMIS	Emergency Management Information System
EOC	Emergency Operations Center
ESF	Emergency Support Function
ESIM	Evacuation SIMulation, part of Oak Ridge Evacuation Modeling System (OREMS)
FEMIS	Federal Emergency Management Information System
FTP	File Transfer Protocol
GB	Gigabyte--billions of bytes
GIS	Geographic Information System
GMT	Greenwich mean time
GPF	General Protection Fault
GUI	Graphical User Interface
ICG	Oracle7 for Sun SPARC Solaris 2.5.1 Installation & Configuration Guide Release 7.3.2
IBS	Integrated Baseline System
IDYNEV	Interactive DYNamic EVacuation
IP	Internet Protocol
KB	Kilobyte--thousands of bytes
LAN	Local Area Network
MB	Megabyte--millions of bytes
Met	Meteorological
NFS	Network File System
NTP	Network Time Protocol
ODBC	Open Data Base Connectivity
OREMS	Oak Ridge Evacuation Modeling System
PC	Personal Computer
PNNL	Pacific Northwest National Laboratory, formerly Pacific Northwest Laboratory (PNL)
RAM	Random Access Memory
RDBMS	Relational database management system
SMTP	Simple Mail Transfer Protocol
SQL	Structured Query Language
SQL script	Sequence of SQL statements that perform database operations
TCP/IP	Transmission Control Protocol/Internet Protocol
TEAD	Name of a FEMIS database (Army Depot) and Tooele Army Depot
UDP	User Datagram Protocol
UNIX	Generic name for the Server Operating System

UTST	Name of a FEMIS database (Utah State)
VB	Microsoft Visual Basic
WAN	Wide Area Network
Windows NT	Microsoft Network Operating System for Workstations
WinSock	Windows Sockets

1.0 Overview

The Federal Emergency Management Information System (FEMIS©)[a] is an emergency management planning and analysis tool that was developed by the Pacific Northwest National Laboratory[b] (PNNL) under the direction of the U.S. Army Chemical Biological Defense Command. The ***FEMIS System Administration Guide*** defines FEMIS hardware and software requirements and gives instructions for installing the FEMIS software package.

This document also contains information on the following: software installation for the FEMIS data servers, communication server, mail server, and the emergency management workstations; distribution media loading and FEMIS installation validation and trouble-shooting; and system management of FEMIS users, login, privileges, and usage. The system administration utilities (tools), available in the FEMIS client software, are described for user accounts and site profile. This document also describes the installation and use of system and database administration utilities that will assist in keeping the FEMIS system running in an operational environment.

The FEMIS system is designed for a single Chemical Stockpile Emergency Preparedness Program (CSEPP) site that has multiple Emergency Operations Centers (EOCs). Each EOC has personal computers (PCs) that emergency planners and operations personnel use to do their jobs. These PCs are connected via a local area network (LAN) to servers that provide EOC-wide services. Each EOC is interconnected to other EOCs via telecommunications links.

FEMIS is a client/server system where much of the application software is located in the client PC. This client software comprises a graphical user interface (GUI) based on Microsoft® Visual Basic, a government furnished dispersion model, and Commercial-Off-The-Shelf (COTS) software tools such as the ArcView geographic information system (GIS), Microsoft Project, and GroupWise™ electronic mail (E-mail).

A UNIX™ host provides E-mail services, Oracle® database management system (DBMS) services, Arc/Info® GIS capabilities, and basic file management services. A PC communication utility is available to interface with external subsystems. The weather data collection system (Met) is currently the only external subsystem.

The FEMIS PC software accesses the site specific database on the server and returns it to the PC. The user then adds information, makes decisions, displays maps, or uses other FEMIS functionality. Decisions or information are passed back to the FEMIS database and notifications are made to the FEMIS users.

(a) FEMIS software was copyrighted in 1995 by Battelle Memorial Institute.

(b) Pacific Northwest National Laboratory is operated for the U.S. Department of Energy by Battelle Memorial Institute under Contract DE-AC06-76RLO 1830.

Proper installation of the FEMIS software is crucial to the operations of the emergency management system. Many software elements must be installed on a variety of servers and client workstations. Each must be installed and configured according to specifications for proper interoperability.

FEMIS is an integrated software product that resides on a client/server computer architecture. The main body of FEMIS software, referred to as the FEMIS Application Software, resides on the PC client(s) and is directly accessible to emergency management personnel. The remainder of the FEMIS software, referred to as the FEMIS Support Software, resides on the UNIX server. The Support Software provides the communication, data distribution, and notification functionality necessary to operate FEMIS in a networked, client/server environment. Because the FEMIS support functionality is accessed via the FEMIS application, the general FEMIS user will not be aware of the FEMIS UNIX server.

To operate FEMIS, the Application Software must have access to the FEMIS emergency management database. The FEMIS database resides on the UNIX server and contains both relational and geographic information. Data that pertains to an individual EOC jurisdiction is stored on the EOC's local server. Information that needs to be accessible to all EOCs is automatically distributed by the FEMIS database to the other EOCs at the site.

To run the FEMIS software, you **must** have a FEMIS database. A FEMIS database will be provided by Pacific Northwest National Laboratory when FEMIS is installed at your site, and it **must** be tailored for each individual FEMIS site. The FEMIS test database will be generated from the Integrated Baseline System (IBS), the Emergency Management Information System (EMIS), TIGER maps, Census data, and from emergency managers' input (see the Site Survey in the ***FEMIS Data Management Guide***).

1.1 Installation

This section discusses the FEMIS environment and storage requirements as well as provides the FEMIS Quick Start Checklist.

1.1.1 Environment

For FEMIS to operate correctly, the first step is to install all of the COTS software, including Oracle v7.3 on your UNIX system. FEMIS will not operate correctly if older versions of the COTS software than those specified in Section 13.1 of this guide are installed.

FEMIS uses NFS Maestro™, a Hummingbird Communications Ltd. product, as its Network File System (NFS) for PC network communications. The NFS Maestro client has been tested by PNNL and is fully compatible with FEMIS requirements. Although other vendors may claim to offer a fully standard NFS, PNNL has not verified and tested any other NFS configurations for PCs, and thus, cannot endorse such installations.

1.1.2 Storage Requirements

The FEMIS application requires disk space on both the client and server machines. PNNL has estimated the disk space requirements for each.

FEMIS Server

Disk space on the FEMIS server is used for:

- Server software (such as, the RDBMS [relational database management system], electronic mail, the evacuation model).
- FEMIS application.
- FEMIS server utilities (notification, database monitor, replication).
- EOC databases (including archived and historic data).
- Storage of the FEMIS COTS software and the static GIS maps.

The above items can require 15+GB of storage to properly support FEMIS.

There are two sources of disk space associated with a FEMIS server as defined by the ***FEMIS Bill of Materials (BOM)***:

1. System disk(s) resident in the Sun Server.
2. Sun SPARCstorage Array connected to the Sun Server.

As stated in the ***FEMIS Bill of Materials (BOM)***, PNNL recommends that the FEMIS storage requirement be fulfilled by using the Sun SPARCstorage Array to ensure that speed and reliability are provided to the FEMIS operational system. PNNL expects the FEMIS application to be placed in its entirety on the arrayed storage disks, which will enable the System Administrators (and PNNL) to better manage the FEMIS product and the EOC databases. PNNL expects the Sun SPARCstorage Array to be reserved solely for FEMIS use.

The system disks are not directly used by FEMIS. The disks are used for the operating system and the supporting applications. PNNL estimates that approximately 2GB of system disk space will be used for the operating system, swap space, etc. Additional system disk space should be used at the System Administrator's discretion.

PNNL is encouraging each site to begin using the Sun server and PCs. Additional system disks can be used to setup network shares for local EOC use.

FEMIS PC

Disk space on the client PC is required for:

- COTS software needed for FEMIS (Windows NT, ArcView, Microsoft Project, SQL*NET, and other supporting applications).
- FEMIS application.
- Site specific GIS maps.

PNNL estimates the FEMIS application and supporting software will require approximately 900MB of disk space.

PNNL requests that you follow these guidelines regarding installation of FEMIS PCs:

1. Install all of the FEMIS COTS software, using the versions identified in the ***FEMIS Bill of Materials (BOM)***.
2. Do not partition large disks into multiple drives. Leave the system configured with a single `c:` drive.
3. Install your software and/or files into a well defined directory so they can be effectively managed.

1.1.3 FEMIS Quick Start Checklist

A Quick Start Checklist identifies the steps that should be taken to ensure a smooth installation of FEMIS and provides an outline of the tasks that must be completed before FEMIS will run.

Server Tasks

Verify the proper version of the following applications have been installed on the server.

1. Solaris™
2. Novell Group Wise E-mail
3. NFS Maestro
4. Oracle.

Also verify that Oracle users have been defined for the server.

PC Tasks

Verify the proper version of the following applications have been installed on PCs.

1. Windows NT

2. NFS Maestro (must have installed NFS Maestro on server prior to beginning this step).

3. SQL*Net

4. COTS software.

Note: None of the PC tasks are dependent on the server tasks except the installation of NFS Maestro on the PCs.

Checklist

___1 Load FEMIS Support Software on the UNIX server.

___2 Start the FEMIS Support Software on the UNIX server

___ Notification Service ___ Met Simulator
___ Command Service ___ EMIS/FEMIS Data Exchange Interface.

___3 Load the appropriate EOC FEMIS database on the UNIX server.

___4 Validate COTS software installation on the PCs.

___5 Load FEMIS Client Software and GIS maps on PCs.

___6 Complete FEMIS installation by adding Met Server and Met Simulator PCs to the FEMIS network.

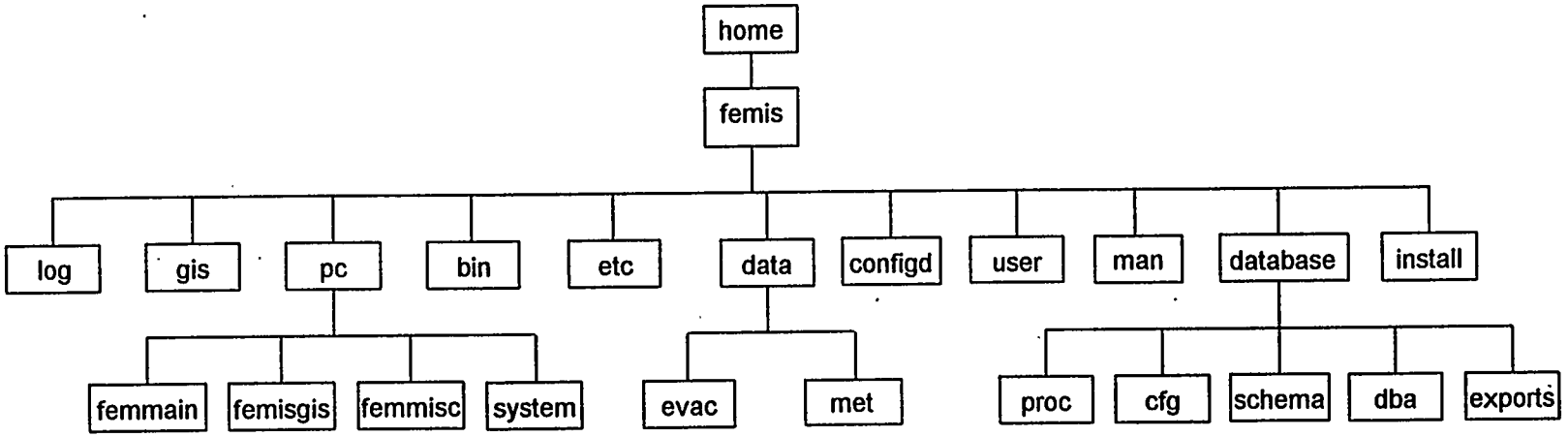
1.2 Administration

The second step towards correct operation of FEMIS is proper administration, which includes the FEMIS software and COTS software on both the PCs and UNIX server. The EOC and site System Administrator are encouraged to become familiar with this document and with the COTS software documentation.

1.3 FEMIS Directory Structures

The following figures illustrate the FEMIS directory structure on the UNIX server and the directory structure for an emergency management workstation.

UNIX Server FEMIS Directory Structure



UNIX Server COTS

- o Sun Solaris
- o Oracle RDBMS with distributed option
- o SQL*Plus
- o Oracle SQL*Net
- o Protocol Driver for TCP/IP
- o ArcInfo
- o Novel GroupWise Client/Admin Pack
- o Novel GroupWise Message Server Pack for UNIX
- o Novel GroupWise SMTP Gateway for UNIX
- o Hummingbird Communications Ltd. NFS Daemon

Emergency Management Workstation
C:
BATCHES.BAT
NETFEMIS.BAT
WINDOWS
SYSTEM
FEMIS.INI
FEMISDB.INI
FEMISUSR.INI
FEMISVER.INI
FEMISWIN.INI
ODBC.INI
PROJ2ACC.INI
WINPROJ4.INI
FEMIS
GIS
FEMISGIS.INI
FEMISGIS.APR
multiple files
and
directories
USER
TOOLS
FMONPC.EXE
FWATCH.EXE
WS_WATCH Files
ORAWIN
NETWORK
ADMIN
SQLNET.ORA
TNSNAMES.ORA
TNSNAV.ORA
WINPROJ
GLOBAL.MPT
COTS
o Microsoft Windows NT Workstation
o ArcView
o Novell GroupWise Client for Windows
o Hummingbird Communications Ltd. NFS
o Microsoft Project
o Oracle SQL*Net
o Oracle TCP/IP adapter
o WordPerfect for Windows (optional)
o Microsoft Office (optional)
o Microsoft Excel
o Microsoft PowerPoint

2.0 FEMIS UNIX Installation

The UNIX server is the primary data and information storage and distribution component. Its primary software elements consist of the Oracle Database Management System; the Evacuation SIMulation (ESIM) model with supporting processes; the Notification Service; the command server; the meteorology (Met) data receiver; the FEMIS/EMIS Data Exchange Interface (DEI); and the sockets communications service.

The programs discussed require the UNIX environment on a Sun computer running Solaris v2.5.1 and utilizing standard Berkeley Sockets.

The FEMIS software consists of four major parts:

1. Installing the UNIX Commercial-Off-The-Shelf (COTS)
2. Installing the FEMIS UNIX Software
3. Creating the FEMIS Database
4. Checking the FEMIS Startup

The release media consists of files distributed on either a CD-ROM or 8mm cartridge tape. The release material contains the necessary scripts and data to perform an initial installation or to upgrade existing FEMIS software to the current version. The Release Notes should be read before proceeding with the UNIX installation.

2.1 Installing the UNIX COTS

The following sections describe the installation of the UNIX COTS.

2.1.1 Installing the Operating System

For installation or upgrade instructions, see the documentation provided with the operating system.

2.1.2 Installing Oracle

Note: FEMIS has been tested using Oracle v7.2 and v7.3. Do not install a version earlier than v7.3.

Before beginning the Oracle installation, you must have the current *Oracle7 for Sun SPARC Solaris 2.5.1 Installation & Configuration Guide Release 7.3.2*, also called the ICG. The following instructions provide a general outline of the steps required to install Oracle and identify specific parameter settings required by FEMIS. These instructions are intended to be used in conjunction with the ICG.

The following Oracle products must be installed.

Oracle Server Manager
Oracle Installer and Documentation Viewer
Oracle7 Distributed DB Option
Oracle7 Server
PL/SQL
ProC
ProFor
SQL*Net
SQL*Plus
TCP/IP Protocol Manager.

2.1.2.1 Installation

Follow all pre-installation tasks for the Oracle server and for all Oracle products to be installed (see the ICG). Any instructions in the ICG for products that are not listed above can be disregarded. Pre-installation tasks include the following:

- Set shared memory (kernel) parameters
- Create groups
- Create Oracle logins
- Create required directories
- Set permissions
- Set environment variables
- Decide on file placements to produce the best performance.

Note: It is vital to configure the operating system shared memory parameters correctly. See the FEMIS Release Notes for the parameters and their recommended values.

Follow the instruction in the ICG to start the installer and load Oracle from the Oracle CD.

Following some initial prompts, you will be asked to chose the desired action. Select the `INSTALL/UPGRADE SOFTWARE ONLY` option. During the installation process you will be queried for information via several dialog boxes. In most cases, a value (representing the value you specified in an environment variable during the pre-installation tasks) will be displayed as the default value and should be selected. The following paragraphs give additional guidance.

For the NLS dialog, select `American/English`.

For the Relink dialog, select `Yes`.

For the character set dialog, select `USA7ASCII`.

For the Server Manager dialog, both Server Manager options (`character mode` and `MOTIF`) should be selected.

Oracle uses environment variables to pass information. As part of the install, these variables are as follows:

`ORACLE_HOME`	path to Oracle products
`ORACLE_SID`	name of instance
`ORACLE_TERM`	type of terminal
`TNS_ADMIN`	path to Listener parameter files.

Once you have completed the Install/Upgrade Software process, exit the installer. FEMIS requires a `db_block_size` of 4KB. To set the database `db_block_size` parameter to 4KB, the Oracle products installation must be performed separately from the database creation. If you choose the complete software/database fresh install, you will have to recreate the database after changing the `db_block_size` parameter.

The file that controls the block size is in `$ORACLE_HOME/rdbms/install/rdbms`. To set the `db_block_size` parameter, copy the original file to `initx.org`. Add the following line to the top of the `initx.orc` file following the specification of the location of the `configfix.ora` file:

```
db_block_size = 4096
```

Restart the installer to create the database. Select the `CREATE NEW DATABASE OBJECTS` option.

When specifying files for the database tablespaces, spread the files across as many drives as possible. Be sure to put the files for the rollback segments tablespace, system tablespace, and redo log files on separate drives. All redo log files can be on the same drive. Redo log files should be set to 20MB for the FEMIS application.

Spread the control files across three drives. The control files are small and have very little activity but are key to database recovery.

Note: Do not let the failure of a single disk take out all of the control files.

Oracle stores your answers to the installation dialog boxes in a file named `usrdfl.log`. The following is an example of this file and can be used to help you decide on answers to other dialog boxes you may encounter.

```
unix.Oracle_Doc=/apps/oracle/doc
unix.skip_readme=TRUE
unix.readme_ver=7.3.2
unix.Owner=oracle
unix.Inst_Action=Create new database objects
unix.Doc_Load=For all products being installed.
unix.Oracle_Sid=tead1
unix.lang=American/English
unix.Port_Spec_Doc=TRUE
unix.CD_Doc_Install=For all products being installed.
rdbms.dba_group=dba
rdbms.db_char_set=US7ASCII
rdbms.orapwd_pw_get=FALSE
rdbms.start_lsnr=FALSE
rdbms.dflt_ctrlf_ok=FALSE
rdbms.control1_file=/u01/apps/oracle/tead1/control01.ctl
rdbms.control2_file=/u02/apps/oracle/tead1/control02.ctl
rdbms.control3_file=/u03/apps/oracle/tead1/control03.ctl
rdbms.all_db_defaults_okay=FALSE
rdbms.system_file=/u01/apps/oracle/tead1/system01.dbf
rdbms.system_size=60M
rdbms.log1_file=/u02/apps/oracle/tead1/redo01.log
rdbms.log1_size=20M
rdbms.log2_file=/u02/apps/oracle/tead1/redo02.log
rdbms.log2_size=20M
rdbms.log3_file=/u02/apps/oracle/tead1/redo03.log
rdbms.log3_size=20M
rdbms.rbs_file=/u03/apps/oracle/tead1/rbs01.dbf
rdbms.rbs_size=50M
rdbms.temp_file=/u04/apps/oracle/tead1/temp01.dbf
rdbms.temp_size=15M
rdbms.users_file=/u05/apps/oracle/tead1/users01.dbf
rdbms.users_size=15M
rdbms.tools_file=/u05/apps/oracle/tead1/tools01.dbf
rdbms.tools_size=15M
plus.do_inst_help=TRUE
plus.do_inst_demo=TRUE
svrmgr.gui_choice=Motif Bitmapped Interface|Character Mode Interface
unix.get_x_lib=/usr/dt/lib
unix.get_motif_lib=/usr/openwin/lib
unix.append_root_inst=TRUE
unix.sv_rtsh=/u00/apps/oracle/product/7.3.2/orainst/root.sh0
unix.Spawn_Xterm=TRUE
```

2.1.2.2 Configuring the Oracle Server for FEMIS

After installation, the `init.ora` file in the `$ORACLE_HOME/dbs` directory must be modified. The replication parameters must be added for multiple server configuration and the default parameters edited to reflect a large size database for a 1000e server. An example of the default parameter settings and replication parameters can be found throughout and at the bottom of the following sample `init.ora` file respectively. The database server must be restarted for the changes in the `init.ora` file to become effective.

```
# $Header: initx.orc 7001300.6 95/02/11 14:16:11 wyim Osd<unix> $

# include database configuration parameters
ifile                       = /apps/oracle/admin/fi7/pfile/configfi7.ora

db_block_size=4096

rollback_segments           = (r01,r02,r03,r04)

###########################################################################
# Some parameter settings are generic to any size installation.
# For parameters that require different values in different size
# installations, three scenarios have been provided: SMALL, MEDIUM
# and LARGE.  Any parameter that needs to be tuned according to
# installation size will have three settings, each one commented
# according to installation size.
#
```

```
# Use the following table to approximate the SGA size needed for
# the three scenarios provided in this file:

##              -------Installation/Database Size------
#                       SMALL       MEDIUM      LARGE
#  Block        2K      4500K       6800K       17000K
#  Size         4K      5500K       8800K       21000K
#
# To set up a database that multiple instances will be using, place all      # instance-specific
parameters in one file, and then have all of these files # point to a master file using the IFILE
command.  This way, when you change # a public parameter, it will automatically change on all
instances.  This is # necessary, since all instances must run with the same value for many       #
parameters. For example, if you choose to use private rollback segments,    # these must be specified
in different files, but since all gc_* parameters  # must be the same on all instances, they should be
in one file.
#
# INSTRUCTIONS: Edit this file and the other INIT files it calls for your    # site, either by using
the values provided here or by providing your own.    # Then place an IFILE= line into each
instance-specific INIT file that points # at this file.
###############################################################################

 compatible = 7.3.2
 global_names = TRUE

#mts_dispatchers="ipc,1"
#mts_max_dispatchers=10
#mts_servers=1
#mts_max_servers=10
#mts_service=fi7
#mts_listener_address="(ADDRESS=(PROTOCOL=ipc)(KEY=fi7))"

db_files = 20

# tuning parameters
##                                                Size
##                                                Used       Small      Medium      Large
##                                                -----      -----      ------      -----

  db_file_multiblock_read_count = 32              # L #      8          16          32

  db_block_buffers = 9000                         #xL #      200        550         3200

  shared_pool_size = 27000000                     #xL #      3500000    6000000     9000000

  log_checkpoint_interval = 10000

  open_cursors = 300                              #       For DES2 (default=50)

  processes = 300                                 #xL #      50         100         200

  dml_locks = 500                                 # L #      100        200         500

  log_buffer = 819200                             #xL #      8192       32768       163840

  sequence_cache_entries = 100                    # L #      10         30          100

  sequence_cache_hash_buckets = 89                # L #      10         23          89

#          # audit_trail = true      # if you want auditing
#     # timed_statistics = true      # if you want timed statistics
     max_dump_file_size = 10240      # limit trace file size to 5 Meg each

log_archive_start = true        # if you want automatic archiving
log_archive_dest  = /files7/apps/oracle/fi7/dbs/arch

# For Replication use these parameters

job_queue_processes = 5
job_queue_interval = 30
job_queue_keep_connections = true
```

2.1.2.3 Oracle SQL*NET Configuration

SQL*Net v2.0, uses several configuration files on the servers and the clients. These files are supplied with the installation media. Refer to the Release Notes for instruction on how to check and/or modify these for your site.

2.1.3 Installing the NFS Maestro

The NFS Maestro has been included with FEMIS v1.3. To install the NFS Maestro, insert the FEMIS tape into the tape drive and enter the following command:

```
# pkgadd -d /dev/rmt/??
```
where ?? is the device number of the tape drive

Follow the prompts through the installation.

To start the NFS Maestro:

```
# sh /etc/init.d/hclnfs start
```

2.1.4 Installing Novell GroupWise

As part of the FEMIS system, Novell GroupWise provides the electronic mail (E-mail) service.

2.1.4.1 E-mail Components

The E-mail server resides on the UNIX server and is comprised of a collection of Novell software, which work together to provide the mail services required for FEMIS. The following software will need to be installed on the UNIX server:

Novell GroupWise v4.1 Client/Admin Pack for Windows
Novell GroupWise v4.1 Message Server Pack for UNIX
Novell GroupWise v4.1 SMTP Gateway for UNIX

The Client/Admin Pack for Windows contains DOS-based GroupWise administrative software, the GroupWise for Windows client, and five mailbox licenses. Additional license packs may be required to have one license per mailbox. Refer to the Novell GroupWise documentation for complete installation instructions.

2.1.4.2 E-mail Installation Overview

The E-mail installation includes the completion of the steps listed below:

Prepare the server for installation
Install Novell GroupWise v4.1 Client/Admin Pack for Windows
Install and Configure the Primary Message Server
Install and Configure the SMTP Gateway

Configure Links to External GroupWise Systems
Set up Account Passwords
Set up Proxy Access.

These steps are discussed in more detail in this section.

2.1.4.3 Before Installing Novell GroupWise

Decide on the installation path	`/apps/grpwise`
Decide on the E-mail domain name	`gwdomain`
Decide on the E-mail post office name	`po`
Decide on the SMTP external gateway name	`smtp`
Determine the network domain name	`foo.com`

2.1.4.4 Installing and Configuring of Novell GroupWise v4.1

GroupWise requires a directory on the UNIX server for the installation and storage of the domain and post office. On the UNIX server, create a directory for the GroupWise software.

1. Log in as `root`.

   ```
   # su -
   ```

2. Create the installation directory.

   ```
   # mkdir /apps/grpwise
   ```

GroupWise requires an administrative account for PC access to the UNIX server. On the UNIX server, create a `gwadmin` account.

1. Create the `gwadmin` group.

   ```
   # groupadd -g 30001 gwadmin
   ```

2. Create the `gwadmin` account with the installation directory as the home directory.

   ```
   # useradd -u 30001 -g 30001 -c "GroupWise Administrator" -d
   /apps/grpwise -s /bin/csh gwadmin
   ```

3. Set the `gwadmin` password

   ```
   # passwd gwadmin
   ```

4. Change the ownership of the home directory

   ```
   # chown gwadmin /apps/grpwise
   # chgrp gwadmin /apps/grpwise
   ```

5. Verify the GroupWise directory is exported. If the directory is not exported, add the directory to the `/etc/dfs/dfstab` file, use the share command to export the directory, and restart the NFS Maestro daemon.

2.1.4.5 Installing the Novell GroupWise v4.1 Client/Admin Pack

To install the GroupWise Client/Admin Pack for Windows on the UNIX server, complete the following steps:

1. From a Windows NT machine, edit the Windows NT `SYSTEM32\CONFIG.NT` file. Change the DOS variable `FILES` to 50 and save the file. Open a DOS command window and connect to the UNIX server:

```
c:\> nfs register gwadmin
c:\> nfs link l: \\<hostname>\/<partition>/.../grpwise /l:s /p:775
```

   Drive `l:` will be used to load and administer the GroupWise software.

2. Create the `l:\gwdomain` directory which will be the GroupWise domain directory.

```
c:\> l:
c:\> mkdir gwdomain
```

3. Use the vendor's install program on the Admin 1 disk to install the software in the `l:\gwdomain` directory. Select the Administration and Windows Client files for installation. Upon completion of the installation, the DOS administrative interface, `ad.exe`, will be started. The `ad.exe` program is used to create the domain, post offices, and user mailboxes.

4. Follow the prompts to create an E-mail domain. Set the correct time zone and daylight savings time, if applicable. Change the default network type to `Other`. While creating the post office, from the Copy Software window, select `Copy Windows Client Software`. The `ad.exe` program will prompt to create a user, after adding the initial user you may continue to add users or proceed with the install. To proceed with the install, select `Admin`.

2.1.4.6 Installing and Configuring the Message Server

To install the Message Server proceed with the following steps:

1. From the UNIX server mount the Message Server CD. Change directories to the `/cdrom/cdrom0` directory and execute the install script, `./install.gw`. Follow the prompts through the install choosing yes for the TCP/IP transport option. After completing the install, eject the CD.

2. Define the following environment variables:

   `ADDOM` - E-mail domain directory (`/apps/grpwise/gwdomain`)

`MSBIN` - E-mail message server directory (`/apps/grpwise/gwdomain/wpcs`)

`XAPPLRESDIR` - E-mail message server directory, (`/apps/grpwise/gwdomain/wpcs`)

3. Start the message server to create the message server subdirectories.

```
# ${MSBIN}/ofcs
```

After the message server starts, select `7-exit` and `2-Terminate Server`.

4. Configure the application servers and transports by editing the `/apps/grpwise/gwdomain/csconfig` files to look like the following two files:

```
;------------------------------------------------------------
;
;    This is the GroupWise 4.1 Message Server configuration file
;  for "Transport".
;    Entries in this file represent applications/transports that
;  the message server will deliver incoming MF files to.
;
;    Format:
; ID       Mode         ExecutableName                    Command-Line
Switches ...
;
;DOSOFS    PIPE         $MSBIN/ofcopyt                    -l13 -s
wpcsout/ofs
;
;------------------------------------------------------------
;
#
# Novell GroupWise 4.1 File Copy transport
nfs        PIPE         $MSBIN/ofcopyt                    -l12 -ls256 -lt7
#
#
# Novell GroupWise 4.1 TCP-IP transport (3.1 compatible)
tcp        PIPE         $MSBIN/oftcpt                     -l13 -ls256 -lt7
#
#
# Novell GroupWise 4.1 Gateway delivery transport (file copy)
gatewp     COMMANDLINE  $MSBIN/ofcopyt                    -l12 -ls256 -lt7
#
# END
```

```
;-------------------------------------------------------------
;
;    This is the GroupWise 4.1 Message Server configuration file
;  for "Application Server".
;    Entries in this file represent applications/transports that
;  the message server will deliver incoming MF files to.
;
;    Format:
; ID        Mode      ExecutableName              Command-Line Switches ...
;
;DOSOFS     PIPE      $MSBIN/ofcopyt              -ll3 -s wpcsout/ofs
;
;-------------------------------------------------------------
;
#
# Novell GroupWise 4.1 application server
ofs       PIPE        $MSBIN/ofcopyt              -s wpcsout/ofs -ll2 -ls256 -lt7
#
#
# Novell GroupWise 4.1 Task application server
css       PIPE        $MSBIN/ofcssa               -ll2 -ls256 -lt7
#
#
# WP Office 3.1 - Novell GroupWise 4.1 message converter server
mfc       RESIDENT    RESIDENT                    -ll2 -ls256 -lt7
#
#
# Novell GroupWise 4.1 Administration application server
ads       PIPE        $MSBIN/ofcopyt              -s wpcsout/ads -ll2 -ls256 -lt7
#
# END
```

5. From the PC, configure the message server using `ad.exe`.

   Open the Domain Information window and select M for Message Server Configuration. Set the Platform to UNIX and the Execution; Message Delivery to `Server Always`. A warning message will be displayed; select `Continue`. Input the UNIX server's IP address into the TCP/IP Settings Address field, and change the port number to 7200. Select OK to continue.

6. Using `ad.exe`, define the message server's link to the post office.

   From the Domain Information window, select M for Mess. Serv. Conf. Select K for Network Links. Highlight the post office and select `Edit Link`. Enter the UNIX path to the post office directory. Select `Close` to continue.

7. From the UNIX server, change to the `/apps/grpwise/gwdomain/wpcs` directory and edit the `start-ms` and `stop-ms` scripts to look like the following:

```
#!/bin/sh
#
# start-ms
# used to start the GroupWise servers as daemons
#
# Define required environment variables
# -------------------------------------
ADDOM=/apps/grpwise/gwdomain
MSBIN=${ADDOM}/wpcs
XAPPLRESDIR=${MSBIN}
LD_LIBRARY_PATH=/usr/ucblib
LD_LIBRARY_PATH
Append to export line
export MSBIN ADDOM XAPPLRESDIR
#
# Define permissions
# ------------------
umask 113
#
# Start servers
# -------------
#
# ** Post Office Server **
#
$MSBIN/ofsa -ll2 -r2 -t5 -o /apps/grpwise/po -u 1> /dev/null 2>&1
#
# ** Administration Server **
#
$MSBIN/ofadsa -ll2 -r2 -t5 -o /apps/grpwise/gwdomain -u 1> /dev/null 2>&1
#
# ** SMTP Gateway **
#
cd /apps
$ADDOM/wpgate/smtp/smtp -home-$ADDOM/wpgate/smtp -daemon -ll-verbose cd /
#
# ** Message Server **
#
$MSBIN/ofcs -o -ll2 -r5 -t2 -u

exit 0
```

```
#!/bin/sh
#
# stop-ms
# used to stop the GroupWise server daemons
#
# Define required environment variables
# -------------------------------------
ADDOM=/apps/grpwise/gwdomain
MSBIN=${ADDOM}/wpcs
export MSBIN ADDOM
#
# Stop servers
# ------------
#
# ** Post Office Server **
#
PID=`/usr/bin/ps -ef | grep wpcs/ofsa | grep -v grep | head -1 | awk '{print
$2}'`
if [ ! -z "$PID" ] ; then
  /usr/bin/kill ${PID} 1> /dev/null 2>&1
fi
#
# ** Administration Server **
#
PID=`/usr/bin/ps -ef | grep wpcs/ofadsa | grep -v grep | head -1 | awk '{print
$2}'`
if [ ! -z "$PID" ] ; then
  /usr/bin/kill ${PID} 1> /dev/null 2>&1
fi
#
# ** SMTP Gateway **
#
PID=`/usr/bin/ps -ef | grep wpgate/smtp | grep -v grep | head -1 | awk '{print
$2}'`
if [ ! -z "$PID" ] ; then
  /usr/bin/kill ${PID} 1> /dev/null 2>&1
fi
#
# ** Message Server **
#
$MSBIN/ofcs -k

exit 0
```

8. Create the `oftcprx.start` file in the `/apps/grpwise/gwdomain/wpcs` directory.

```
#!/bin/sh
#
# oftcprx.start
# Calls the GroupWise TCP receive process
#
# Define required environment variables
# -------------------------------------
ADDOM=/apps/grpwise/gwdomain
MSBIN=${ADDOM}/wpcs
export ADDOM MSBIN
LD_LIBRARY_PATH=/usr/ucblib
LD_LIBRARY_PATH
Append to export line
export MSBIN ADDOM XAPPLRESDIR
#
# Start the GroupWise TCP receive process
# ---------------------------------------
exec ${MSBIN}/oftcprx

exit 0
```

9. Modify the `oftcprx` line in the `/etc/inetd.conf` file to contain the following

```
oftcprx stream tcp nowait root
/apps/grpwise/gwdomain/wpcs/oftcprx.start
```

10. Modify the `oftcprx` port number in the `/etc/services` file to the following

```
oftcprx 7200/tcp #Novel GroupWise 4.1 Receive Server
```

11. Cause `inet.d` to reread the `inetd.conf`

```
# kill -HUP <INET PID>
```

2.1.4.7 Installing and Configuring the SMTP Gateway

To install the SMTP (Simple Mail Transfer Protocol) Gateway, perform the following steps:

1. From the UNIX server mount the SMTP Gateway CD. Change directories to the `/cdrom/cdrom0` directory and execute the install script, `./install.gw`. Follow the prompts through the install. After completing the install, eject the CD.

2. Configure the UNIX server to recognize the SMTP Gateway for message delivery by modifying the UNIX server `sendmail.cf` file.

   From the SMTP Gateway directory execute the `./cnfsndml` program. When prompted for the gateway name, enter the external name of the SMTP Gateway.

   If the UNIX server is not the send mail mailhost, the following manual edits to the `/etc/mail/sendmail.cf` are required:

   After the local UUCP connections section, add the following:

```
# GroupWise Modification
Dzfoo.com
```

   Before the WP SMTP additions, add the following:

```
# GroupWise Modification
R$+<@$=G.$z>$*  $#wpsmtp $@$2 $:$1<@$2>$3
```

   After completing the edits to the `sendmail.cf` file, restart `sendmail`.

3. Using `ad.exe` from the PC, create and configure the SMTP Gateway using the external name as the Foreign Name.

4. From the UNIX server, change to the message server directory and execute the `start-ms` script to start the E-mail processes.

5. Work with the Domain Name Services (DNS) database administrator to add the SMTP external gateway name to DNS.

2.1.4.8 Configuring Links to External GroupWise Systems

GroupWise will exchange messages with other GroupWise domains if external links are configured. To configure an external link, perform the following steps:

1. Create the external domain, setting the Domain Type to External GroupWise 4.x. After creating the external domain, open the Domain Information window and select `M` for Message Server Configuration. Choose `5` for TCP/IP Settings and input the external UNIX server's IP address.

2. Highlight the Primary Domain and open the Domain Information window. Select `M` for Message Server Configuration and open Network Links. Highlight the external domain and choose `Edit Link`. Select a `Direct` link using the `TCP/IP Protocol`.

2.1.4.9 Configuring GroupWise to Start Automatically

To configure GroupWise to start when the UNIX server is booted and stop when the UNIX server is shutdown, an `rc` script must be created. Create the following script and save it as

```
/etc/init.d/grpwise:
```

Perform the following commands to link the script to the `rc` directories:

```
# ln /etc/init.d/grpwise /etc/rc3.d/S99grpwise
# ln /etc/init.d/grpwise /etc/rc0.d/K25grpwise
```

2.1.4.10 Setting Up GroupWise Account Passwords

To set up an account password, perform the following procedure:

1. From the PC, double click the GroupWise icon.

2. Log in as the user for whom to set the password.

3. Select the `File|Preferences` menu item.

4. Double click the Password icon. GroupWise will prompt for a password and prompt again to verify the password. Enter the password and select `OK`. The password will be set for the account.

2.1.4.11 Setting Up Gateway Aliases

To set up a gateway alias for a regular user, perform the following procedure:

1. Run `ad.exe`.

2. Tab to the `Users` window and highlight the user for whom you would like to create an alias.

3. Press `F6` to edit and click on the Gateway Alias button on the right side of the screen.

4. Select the SMTP gateway and type the alias.

To set up a gateway alias for an outside user, for example, an EMIS user, perform the following procedure:

1. Run `ad.exe`.

2. Highlight the SMTP gateway.

3. Select Create User and input the information to set up a user.

4. Select the Gateway Alias box and choose SMTP. Enter the mail address as the alias, for example, `fcaico@tead-sun4`.

2.1.4.12 Setting Up Proxy Access

The System Administrator should be considered the owner of the position mailboxes for purposes of granting access. Passwords for position mailboxes should not be given out unless they are to be used solely for direct login and not for proxying.

Set up all personal GroupWise mailboxes and all position GroupWise mailboxes, and then log in to each proxy mailbox and perform the following steps:

1. Select `File|Preferences|AccessList` from the menu to bring up the Access List screen.

2. Click on `Minimum User Access`, uncheck all boxes, and click `Apply`.

3. For each position mailbox, from the Access List, click `Add Users`.

4. Double click on each user name that should have access to the position mailbox and Click `OK`.

5. In Access List, click on first user name. Then, with the Shift key pressed, click the last user's name that will have access to the position mailbox. All of the user names between the first and last name selected will be highlighted. These users will have access to the position mailbox.

6. Click `Mail/Phone Read` and `Write and Subscribe To My Notifications`.

7. Click `Apply`. You can double check the accesses you have given by clicking on the names one at a time and seeing what boxes appear checked.

8. When you are satisfied that the Access List and permissions are correct, click `OK`.

9. Click `File|Preferences|Subscribe to Notify`. As above, add the same users so they can be notified of new mail received by this proxy.

2.2 Installing the FEMIS UNIX Software

Installing FEMIS on the UNIX server consists of the following steps:

1. Determine the installation configuration
2. Load FEMIS from tape
3. Define the database topology
4. Configure the FEMIS files
5. Verify the configuration files
6. Setup femis_event
7. Verify the FEMIS programs are running
8. Setup the EOC DBA directory
9. Reboot the server.

2.2.1 Determining the Installation Configuration (as root)

Before installing the FEMIS UNIX software on the server, you must gather the following information.

Determine the FEMIS home directory

(Recommend: `/home/femis`)

Decide upon a password for the FEMIS account

Determine the Oracle settings

`ORACLE_SID`	(Example:	`fi4`)
`ORACLE_BASE`	(Example:	`/files1/app/oracle`)
`ORACLE_HOME`	(Example:	`/files1/app/oracle/product/7.3.2`)
`TNS_ADMIN`	(Recommended:	`/var/opt/oracle`)

If GroupWise is installed, find the

domain directory

(Example: `/apps/grpwise`)

post office directory

(Example: `/apps/grpwise/po`)

If DEI will be installed, decide upon the following items

`FEMX Home Directory`	`(Default: /home/femx)`
`EMIS Host Computer`	`(Example: teadsun)`
`EMIS User-Name`	`(Default: femx)`
`EMIS Password`	`(Example: femxfer)`

Determine the database topology, especially the servers, Oracle user accounts (EOC names), Oracle listeners, and notification ports. For more information, see Section 2.2.3, Defining the Database Topology.

2.2.2 Installing the FEMIS Application, GIS, and Database

Using the Solaris software installation utility, `pkgadd`, the FEMIS application and support files will be installed to the Sun server.

2.2.2.1 Installing the FEMIS Application

Before installing FEMIS verify the system is in a quiet state. No users should be accessing the server.

For new installations of FEMIS,

1. Create the following accounts:

```
# /usr/sbin/groupadd -g 30510 femisrun
# /usr/sbin/useradd -u 30510 -g 30510 -c "FEMISrun Account" -d
/home/femis -s/bin/date femisrun
# /usr/sbin/groupadd -g 30508 femisrun
# /usr/sbin/useradd -u 30508 -g 30508 -c "FEMIS Account" -d
/home/femis -s/bin/csh femis
```

   If you are running DEI, create the following account:

```
femx:x:30509:30509:femis femx-account:/home/femx:/bin/csh
# /usr/sbin/groupadd -g 30509 femx
# /usr/sbin/useradd -u 30509 -g 30509 -c "FEMX Account" -d
/home/femx -s/bin/csh femx
```

2. Create the appropriate home directories for the newly created accounts and set account passwords.

3. Insert the FEMIS application tape into the tape drive, and run the Solaris software installation utility.

   The FEMIS application installation utility will require 40MB of disk space for a spool directory. To create a temporary spool directory, run the following:

```
# mkdir /files1/spool
```

   Spool the installation package from the 8mm tape.

```
# pkgadd -s /files1/spool -d /dev/rmt/??
```

   where ?? is the device number of the tape drive

Run the pkgadd utility to install the FEMIS package.

```
# pkgadd -d /files1/spool
```

4. Select the FEMIS application for installation.

   If the femx account was created prior to the installation, you will asked if you want to install DEI. If the server will be running the FEMIS DEI, select yes to install the DEI options.

   When the installation prompts you to run the scripts, which are executed with super-user permission, select y to continue.

5. Select q to quit, after the FEMIS application has been installed.

6. Use pkgchk to verify the FEMIS package was installed correctly.

   ```
   #pkgchk -n FEMIS
   ```

7. Remove the spool directory, only if you are not installing the GIS or database.

   ```
   # rm -r /files1/spool
   ```

2.2.2.2 Installing the GIS and Database

1. Insert the FEMIS data tape into the tape drive, and run the Solaris software installation utility.

   The FEMIS data installation utility will require 300MB of disk space for a spool directory. To create a temporary spool directory, run the following, only if you have not created the spool when you installed the FEMIS package.

   ```
   # mkdir /files1/spool
   ```

   Spool the installation package fro the 8mm tape.

   ```
   # pkgadd -s /files1/spool -d /dev/rmt/??
   ```
   where ?? is the device number of the tape drive

   Run the pkgadd utility to install the FEMIS package.

   ```
   # pkgadd -d /files1/spool
   ```

2. Select your site's GIS and database.

3. Select q to quit, after the GIS and database have been installed.

4. Use pkgchk to verify the packages were installed correctly.

   ```
   #pkgchk -n <package name>
   ```

5. Remove the spool directory.

```
# rm -r /files1/spool
```

2.2.3 Defining the Database Topology (as femis)

In FEMIS, standard database topologies are either Nx1 or NxN. These number pairs indicate the number of EOC databases and the number of servers. For example, a 3x1 configuration indicates three EOCs on one server. An 8x8 configuration represents eight EOCs on eight servers (one EOC per server).

Note: The Make Configuration (`makecfg.sh`) code generator only creates scripts for Nx1 or NxN topologies. If you have a non-standard topology, say 3x2, as currently exists in Utah, then some of the scripts it creates must be manually edited before they will work. See Section 2.6, Non-Standard Database Topologies, for more information.

2.2.3.1 Configuring the Database Topology

Four configuration files are used to define a topology:

`./etc/eoclist.dat`	EOC List	general topology
`./etc/grplist.dat`	Group List	snapshot groups
`./etc/seqlist.dat`	Sequence List	sequence IDs
`./etc/vuelist.dat`	View List	views

The primary configuration file is the EOC List file, `./etc/eoclist.dat`, which is used by many of the FEMIS shell scripts. The other configuration files are used only by the Make Configuration (`makecfg.sh`) code generator.

The EOC List file consists of one record for each EOC database. Each record consists of eight space-separated columns. Except for the Yes/No flag in column five, nothing should be uppercase.

1: EOC name	name of the EOC and Oracle user account
2: Password	password for the Oracle user account
3: Server	server where the data is located
4: Listener	Oracle listener name for the account
5: Onpost	Y=onpost database, N=offpost database
6: EOC #	EOC number used for sequence IDs
7: Port	FEMIS notification port
8: Others	Comma-separated list of other EOCs, w/o white space

The following is an example of a 3x3 EOC List file:

```
tead tead tornado     fi1 Y 1 9020 ctoo,utst
ctoo ctoo hurricane   fi2 N 2 9020 tead,utst
utst utst photon      fi3 N 3 9020 tead,ctoo
```

The following is an example of a 3x1 EOC List file:

```
tead tead virus    fil Y 1 9021 ctoo,utst
ctoo ctoo virus    fil N 2 9022 tead,utst
utst utst virus    fil N 3 9023 tead,ctoo
```

In the NxN (3x3) example, the server names and listener changed, but the notification ports remained the same. In the Nx1 (3x1) example, the server and listener remained the same, but the notification ports changed.

The Group List file is used to define the database replication setup. It indicates which tables go in which replication groups, plus which tables must have what kind of snapshots. It contains N major sections, the first one normally for just the one onpost EOC (e.g., TEAD), and the remaining ones for the offpost EOCs (e.g., CTOO and UTST). The onpost section is different from the offpost sections, which are alike except for the EOC name in the first column.

The Sequence List file is used to define the Oracle sequence IDs in the database, which are used to generate unique keys when inserting records into the database.

The View List file is used to define which views are created on which tables. The views combine data from other EOCs into a site-wide version of shared tables. For example, the `S_FACILITY` view is a combination of the Facility tables in each of the EOC databases.

2.2.3.2 Running the Build Topology Program

To define a topology, you must create the four configuration files and put them in a standard location, usually `./etc`, using the Build Topology program, `./database/dba/bldtopo.sh`.

1. Login as `femis`

2. `%cd ~femis/etc`

3. `% ~femis/database/dba/bldtopo.sh`

First, the Build Topology program checks to see if you can create files in the current directory. Then it looks for the template files which are used to create the Group List, Sequence List, and View List configuration files. These `*.tpl` files should be in the `./database/dba` directory. Next, it prompts you for information to define the general topology--the EOC List file. If at any point you do not specify something, the program will exit.

```
* * * MSG: Creating EOC      List file (./eoclist.dat)...

Enter port number [9020] ==>
```

If you are creating an Nx1 configuration and there are more than nine EOCs in the database, you must specify a number larger than `9037` (`9040` is recommended). Otherwise, accept the default of `9020`.

```
How many servers?          ==>
```

Enter the number of servers in the topology. For example, for a 3x1, enter "1"; for an 4x4, enter "4" for the number of servers.

NxN Topology

If you are creating an NxN topology, you will get the following prompts.

```
Enter server name     (1) ==>
```

The first time you get this prompt, enter the name of the Sun server which will contain the onpost FEMIS database. For example, for the TEAD database, enter `teadsun`. For later prompts, enter the next server in the list--sort by EOC name.

```
Enter listener              ==>
```

Enter the Oracle listener name for that server. For example, `fi3`.

```
Enter EOC name              ==>
```

Enter the name of the EOC database that will be placed on that server. The EOC name is the same as the Oracle user account and password. For example, `tead`.

The loop then repeats, asking for the next server, listener, and EOC until you have supplied all of them.

Nx1 Topology

If you are creating an Nx1 topology, you will get the following prompts.

```
Enter server name           ==>
```

Enter the name of your server. For example, `virus`.

```
Enter listener              ==>
```

Enter the Oracle listener name for your server. For example, `fi6`.

```
How many EOCs?        ==>
```

Enter the number of EOC databases which will be placed on the server.

```
Enter EOC name      (1) ==>
```

The first time you get this prompt, enter the name of the onpost EOC database. For example, `tead`. For later prompts, enter the next EOC in the list, preferably in alphabetic order.

The loop then repeats, asking for the next EOC until you have supplied all of them.

After you answer all the prompts, the Build Topology program creates the remaining topology files automatically.

```
* * * MSG: Adding Other EOCs field to end of each record
* * * MSG:   Processing EOC #: 1...
* * * MSG:   Processing EOC #: 2...
* * * MSG: Formatting file...
* * * MSG: Listing: ./eoclist.dat
```

The EOC List file will be displayed. If it is not correct, you must run the Build Topology program again.

```
* * * MSG: Creating Group    List file (./grplist.dat)...
* * * MSG: Creating Sequence List file (./seqlist.dat)...
* * * MSG: Creating View     List file (./vuelist.dat)...
* * * MSG: Minor cleanup
* * * MSG: End  : Build Database Topology Definition Files
```

Note: It is essential that all FEMIS servers use the same database topology. Therefore, it is recommended that on one server you define the database topology for the entire site. Then create the `eocdba` directory (Section 2.2.7, Setting Up the EOC DBA Directory) and copy the configuration files and `eocdba` directory from the first server to the other servers.

Note: If you change a configuration file on one server, you must make the same change on all other servers in the topology.

2.2.4 Configuring the FEMIS Files (as root)

Now that you have completed the definition of the database topology, you can configure the FEMIS files by running the FEMIS configuration script.

The FEMIS configuration script uses the database topology, system settings, the `./install/femis_info file`, and Oracle database settings to create the FEMIS configuration files, which will be placed in the `./etc` and `./configd` directories.

To configure the FEMIS files:

1. Login as `root`.

2. Change the directory to the FEMIS install directory, usually `/home/femis/install`.

3. Edit the `femis_info` file so the values match the system setup. The `GW_PATH` should be set to the GroupWise Domain directory. Set the `GW_PO_PATH` to the GroupWise Post Office directory. The Oracle environment variables should be set to match the values given in the `~oracle/.oraclerc` file. The FEMIS DEI variables only need to be set if the server will be running DEI. `EMIS_HOST` should be set to the server name and the `EMIS_USER` should be set to `csepp`.

4. Execute the `# ./configure_files.sh` script and follow the install prompts for EOC name(s) password, if appropriate.

2.2.5 Verifying the Configuration Files (as femis)

Having run the FEMIS configuration script, you must now verify whether the configuration files it created are correct.

1. Login as `femis`.

2. Check that the `femis` account is setup correctly

```
% setenv

    USER=femis

    HOME=/home/femis

    SHELL=/bin/csh

    FEMIS_HOME=/home/femis
```

Oracle environment variables must be set:

```
ORACLE_SID
ORACLE_HOME
```

The PATH environment variable includes

```
/home/femis/bin:/usr/bin:/$ORACLE_HOME\bin
```

3. Check the FEMIS UNIX configuration files.

All installations should have:

```
./etc/cmdserv.conf
```

Onpost installations should also have:

```
./etc/fcmetld.cfg
./etc/femisdei.cfg
./etc/fxcommd.cfg
./etc/femisdei.prf
```

4. Check the FEMIS PC configuration files (see Section 3.3.1 Configuring Files).

```
./configd/netfemis.bat
./configd/ntp.ini
./configd/odbc.ini
./configd/tnsnames.ora
```

```
./configd/sqlnet.ora
./configd/hosts
```

5. Check the system files to verify the FEMIS entries were added.

```
/etc/services
/etc/inetd.conf
```

6. Check the FEMIS startup/shutdown script.

```
/etc/init.d/femis
```

7. Check the FEMIS dot files

```
./.femisrc
./.oraclerc
```

2.2.6 Setting Up femis_event

If all of the UNIX hosts in a CSEPP wide area network (WAN) have one and only one IP address, then this procedure can be disregarded. However, if any of the UNIX hosts have dual ethernet interfaces, i.e., they perform router functions, or for any reason, one or more has multiple (more than one) IP addresses, then pay special attention to this workaround section.

Interconnections between notification servers are accomplished by including the service port and UNIX host name on the startup command line, e.g., `A> femis_event -c 9020@B 9020@C`, where A, B, and C are names of UNIX hosts. Assume for the sake of this discussion that host B has multiple IP addresses, and that all such addresses are included in the `/etc/hosts` files on A and other nodes on the network.

First determine which IP addresses for B, and all multiple IP address hosts in the network, is the primary IP address for host B. Log into B's `femis` account, and run `femis_event` with only the `-i` option. You should get a response such as the following:

```
B% femis_event -i
Last build ....... Thu Oct 17 11:54:08 PST 1996
Host name is ..... B
IP address is .... 111.111.111.111
Port number is ... 9020
```

Now, on all nodes where notification servers are to be executed, ensure there is a unique name in the `/etc/hosts` which resolves to the IP address reported above. For example:

```
A% grep B /etc/hosts
111.111.111.111 B
111.111.222.222 B
```

Be sure to substitute the actual host names for A, B, C, etc. Edit and modify the host's file, adding a host, e.g., BB, name which resolves to a unique IP address. For example:

```
A% grep BB /etc/hosts
111.111.111.111 BB
```

Now, in all start notify files on all hosts, use only the host names which resolve to unique IP addresses. For example:

```
A% femis_event -c 9020@BB 9020@C
B% femis_event -c 9020@A 9020@C
C% femis_event -c 9020@A 9020@BB
```

Check the `/home/femis/bin/startnotify` file to ensure that all host names comply with this workaround. Make the necessary modifications and close the `startnotify` file.

Failing to implement the above workaround for UNIX hosts having multiple IP addresses can have disastrous results. Under some conditions, a `femis_event` process can terminate with a bus error after running out of file descriptors if this workaround is not implemented as described.

2.2.7 Setting Up the EOC DBA Directory (as femis)

As released, FEMIS contains a `./database` directory which has a number of subdirectories, none of which should be changed. However, for your own use, you need a working copy of some of the files. Plus, you need to generate brand new SQL scripts which are specific to your database topology. When you have completed the following steps, you will have your own `./database/eocdba` directory with all the scripts necessary to manage your FEMIS database.

1. Login as `femis`.

2. Create a working directory, `eocdba`, for your own use

   ```
   % cd ~femis/database/dba
   % mkeocdba.sh
   ```

3. Generate the scripts used to load the stored procedures

   ```
   % cd ~femis/database/eocdba
   % makeproc.sh
   ```

   This shell script creates the driver scripts to create (`master_cr_procedures.sql`) and drop (`master_dr_procedures.sql`) the stored procedures in all the FEMIS EOC database accounts. The shell script also creates all the actual server-specific files, `cr_procedures_SERVER.sql` and `dr_procedures_SERVER.sql`.

4. Generate the scripts used to manage and control the database.

```
% cd ~femis/database/eocdba
% makecfg.sh
```

This shell script creates a very large number of SQL scripts.

If you have a non-standard database topology, you will need to modify some of the scripts.

It is essential that all FEMIS servers use the same database topology. Therefore, it is recommended that topology modifications are performed on one server. Copy the `eocdba` and `etc` directories to other servers. In an NxN configuration, the results are copied to the other servers.

2.3 Creating the FEMIS Database

CAUTION

Do not proceed if you have not backed up your current database.

Creating the FEMIS database consists of the following steps:

1. Create user accounts in the database
2. Load new data
3. Create objects that share data
4. Fix the EOC table
5. Start replication
6. Configure multiple sites on a server

The following instructions (Sections 2.3.1 and 2.3.2) will completely replace your current FEMIS database with a new one in terms of both structure **and** content. Therefore, this process will not normally be performed after the initial FEMIS installation.

If you are upgrading your FEMIS software, disregard Sections 2.3.1 and 2.3.2, and refer to the Release Notes.

2.3.1 Creating User Accounts in the Database (as femis)

1. Login as `femis`.

2. Drop FEMIS user accounts from the database, if any are present.

   If FEMIS has been installed on your server before **and** this release includes new data (`.dmp` files), then you must drop all the FEMIS user accounts from the Oracle database.

The easiest way to find out which user accounts need to be dropped is to use the SQL command `select * from all_users;`. Be careful not to drop user accounts which should not be dropped (`SYS, SYSTEM`), plus any user accounts for other site databases. In other words, if you will be loading Utah data, do not drop the Alabama user accounts.

Note: If users are currently using the database, you must stop and restart the database in restricted mode before dropping the users.

```
% cd ~femis/database/eocdba
% sqlplus system/<PASSWORD>
SQL> select * from all_users;
SQL> drop user <USER1> cascade;
SQL> drop user <USER2> cascade;
...and so on
SQL> quit
```

You could refer to the EOC List file to see which accounts will be on your server and might already be there. You could also refer to the `master_cr_db_.sql` script to see which user accounts are created with the `@cr_data_owner` or `@cr_snap_owner` commands.

After dropping the FEMIS users, check to determine if the existing Oracle tablespaces are the same as those specified in the `cr_db_ts_<sever name>.sql` file. If they are different, drop the old tablespaces.

3. Edit the `cr_db_ts_<sever name>.sql` to place the files in the desired directory(s). If possible, place the `fmain` and `findex` tablespaces and the `fsnapshot` and `fsnaplog` tablespaces on different disk drives.

4. Create FEMIS database by running the Master Create Database script. This script creates the new tablespace and user accounts.

```
% sqlplus system/<PASSWORD>
SQL> @master_cr_db_<server name>.sql
```

2.3.2 Loading New Data (as femis)

If the release of FEMIS you received included new data (`.dmp` files), then you need to import them into the corresponding user accounts in the database. For an Nx1 configuration, you will load one of the `.dmp` files into each of the user accounts. For an NxN configuration, you will only load the one .dmp file into the one data user account in the local database. You will not load the .dmp files which correspond to the snapshot user accounts.

Login as `femis`.

```
% cd ~femis/database/exports/<site>
% imp <USER1>/<PASSWORD> file=<USER1_today's date>.dmp
log=<USER1_today's date>.log
```

```
% imp <USER2>/<PASSWORD> file=<USER2_today's date>.dmp
log=<USER2_today's date>.log
```

...and so on

The actual name of the .dmp files will be specific for your site and may contain a date stamp, e.g., `tead_19961210.dmp`.

Example 1: For a 3x1 Utah configuration:

```
% imp tead/tead file=tead_19961210.dmp log=tead_<today's
date>.log
% imp ctoo/ctoo file=ctoo_19961210.dmp log=ctoo_<today's
date>.log
% imp utst/utst file=utst_19961210.dmp log=utst_<today's
date>.log
```

Example 2: For an 8x8 Alabama configuration on the server with the ANAD data user account and seven snapshot user accounts:

```
% imp anad/anad file=anad_19961210.dmp log=anad_<today's
date>.log
```

STOP

If you are installing an NxN topology, complete all steps through the import (above) on all other servers before continuing with the database installation on this server.

If you are installing an Nx1 topology, then continue to the next step.

2.3.3 Creating Objects That Share Data (as femis)

STOP

Before continuing, make sure all servers are online.

At this point, you should have user accounts on all servers and loaded the data. You are now ready to create views, snapshots, synonyms, and other replication-support items.

The Master Create SQL script (`master_cr.sql`) runs scripts which create:

sequence numbers
alternate views

snapshot logs	(NxN)
snapshots	(NxN)
snapshot groups	(NxN)
synonyms for onpost tables	
site views	
replication tables and code	(NxN)

The scripts act on **all** EOCs on **all** servers in the topology.

To run the main script, which can take hours to complete, do the following:

Login as `femis`

```
% cd ~femis/database/eocdba
% sqlplus /nologin @master_cr.sql
```

You need to watch its progress and occasionally press `Enter` when prompted, if everything is running properly.

2.3.4 Fixing the EOC Table (as femis)

The `fixeoc.sh` script changes the Notify port, the UNIX port, the Server name, and EOC number, to match the EOC List file.

Login as `femis`

```
% cd ~femis/database/eocdba
% fixeoc.sh -fix
```

Note: If the UNIX port is wrong, then you will not be able to import or execute evacuation cases. If the Notify port or Server name is wrong, then you will not be notified of events properly while running the FEMIS client software on the PC.

2.3.5 Starting Replication (as femis)

If you have an Nx1 database configuration (3x1 or 8x1, for example), then skip this step.

If you have an NxN database configuration (3x3 or 8x8, for example), then you must start replication, because an NxN database configuration only stores the data for one EOC on each server, and to make it accessible from other servers, the data must be replicated by Oracle.

Note: You should not start replication until **all** the FEMIS databases are installed and configured on all servers at the site.

To start replication, run the Master Start Replication script

Login as femis

```
% cd ~femis/database/eocdba
% sqlplus /nologin
SQL> @rep_start.sql
SQL> quit
```

2.3.6 Populating the GIS-Related Tables

To generate the FEMIS object point themes and populate the GIS_OBJECT database table, perform the following steps:

1. Login as femis.

2. Ensure that the UNIX environment variable FEMIS_HOME is set to the path of the FEMIS home directory.

3. Run the gengis.sh shell script:

   ```
   % cd ~femis/database/eocdba
   % ./gengis.sh
   ```

   This script runs a set of SQL-Plus scripts to generate the FEMIS object point themes from data in the relational database. The FEMIS object point themes include Met towers, igloos, facilities, sirens, and traffic control points. In FEMIS v1.3, the facility, siren, and traffic control point themes are each single combined themes, rather than multiple EOC-based themes as in previous versions of FEMIS. This script also populates the GIS_OBJECT database table based on the contents of the FEMIS_OBJECT table.

4. After the gengis.sh script has run, verify that the following five theme files were created in the appropriate directories and have the current date/time:

   ```
   . . . /gis/<site_code>/mettower/<site_code>_mt.evt
   . . . /gis/<site_code>/igloo_p/<site_code>_ip.evt
   . . . /gis/<site_code>/facility/facility.evt
   . . . /gis/<site_code>/siren/siren.evt
   . . . /gis/<site_code>/tcp/tcp.evt
   ```

   where <site_code> is the onpost EOC code (for example, ANAD).

5. If any of the files are not in their proper directory with today's date/time, check the "current" directory (from which the GENGIS.SH script was run) and the GIS main directory, and move the file(s) to the appropriate subdirectories as listed above.

6. There is a possibility that some facilities may have undefined (null) locations in the database, which may cause FEMIS to operate improperly. To correct this situation, the following SQL-Plus queries must be run for each EOC database. From the UNIX prompt, enter the following:

```
sqlplus <eoc_code>/<password>@<listener_name>
```

where <eoc_code>, <password>, and <listener_name> are the EOC database name, password, and database listener name, respectively.

For example: `anad/anad@fi4`

From the SQL prompt, enter the following:

```
SQL> update femis_object
     set femis_point_x=0.0
     where femis_point_x is null;
```

A message should appear indicating the number of rows that were updated (it may be zero or more).

Now enter a second query:

```
SQL> update femis_object
     set femis_point_y=0.0
     where femis_point_y is null;
```

Again, the number of rows that were updated will be indicated.

Exit SQL-Plus:

```
SQL> exit
```

These updates must be repeated for each EOC database.

2.3.7 Setting Up the Oracle Crontab

To set up the crontab to perform automatic database backups and exports, enter the following:

```
$> cd ~oracle/admin
$> crontab oracle.crontab
```

2.3.8 Configuring Multiple Sites on a Server (as femis)

Note: This step is specifically designed for IEM Inc., at Baton Rogue. All other sites should skip this procedure.

It is possible to have multiple FEMIS sites on a single server. For example, you could have a 3x1 Utah configuration and an 8x8 Alabama configuration on one server. The following discussion considers an example of the first site being the 3x1 Utah configuration, and the second being the 8x8 Alabama configuration.

1. Login as `femis`.

2. Setup a new ./etc directory (change Section 2.2.3).

   The topology configuration files are normally kept in the `./etc` directory. However, on a server with multiple sites, it would not be possible to keep two files with the same name (e.g. `eoclist.dat`) in the same directory. Therefore, you must create another directory for the topology configuration files for the second site database.

   ```
   % cd~femis
   % mv ./etc ./etc.3x1
   % mkdir ./etc.8x8
   % ln -s ./etc.8x8 ./etc
   ```

   You now have two configuration directories, `./etc.3x1` with the files for the 3x1 topology, and `./etc.8x8` which will contain the files for the 8x8 topology. There is also a symbolic link which maps the 8x8 directory to the standard directory. Now that the `./etc` directory exists, you can define the database topology using Section 2.2.3.

3. Create separate `eocdba` directories (change Section 2.2.7).

   For the second site database, you must first rename the current `eocdba` directory.

   ```
   % cd~femis/database
   % mv ./eocdba ./eocdba.3x1
   ```

   Then create and populate the `eocdba` directory using Section 2.2.7. Rename the new `eocdba` directory.

   ```
   % cd~femis/database
   % mv ./eocdba ./eocdba.8x8
   ```

4. Create separate tablespaces.

   The data and indexes for each site should be located in different tablespaces. The current convention is to assign the default and temporary tablespaces to be `FMAIN` and `TEMP` respectively for first site database. Any later site databases would have different default and temporary tablespaces, `NEWFMAIN` and `NEWFINDEX`, for example. To do this, you must change the Create Database Tablespaces script for the second database before creating the user accounts.

   ```
   % cd~femis/database/eocdba.8x8
   % vi cr_db_ts_YOURSERVER.sql
   ```

Next change the Create Data Owner and Create Snap Owner scripts to use the new tablespaces.

```
% vi cr_data_owner.sql
% vi cr_snap_owner.sql
```

Then create the user accounts by completing Step 3 in Section 2.3.1.

5. Setup primary versus alternate configurations (anytime).

Many of the database administration programs look for the topology configuration files in the `./etc` directory. However, if you want to run one of the programs, say the FEMIS Monitor, using the other configuration, it is possible to do so. First, you need to decide which configuration will be the primary one that you want to deal with by default. For this example, select the 3x1 configuration. Create a symbolic link from the 3x1 configuration directory to the standard directory.

```
% cd ~femis
% rm ./etc
% ln -s ./etc.3x1 ./etc
```

Next, edit the `.femisrc` file to set a pointer to the standard directory and create some aliases that will make switching between them easy.

```
% vi .femisrc
```

Add the following four lines at the end of the file.

```
setenv FEMIS_ETCDIR /home/femis/etc
alias swap3x1 "setenv FEMIS_ETCDIR /home/femis/etc.3x1"
alias swap8x8 "setenv FEMIS_ETCDIR /home/femis/etc.8x8"
alias unswap  "unsetenv FEMIS_ETCDIR"
```

The `FEMIS_ETCDIR` environment variable is used by the script (`./database/dba/chkdat.sh`) which gets the names of the topology configuration files for most of the database administration scripts. The script looks for files in the following directories in this order:

```
(the directory specified with the -etc option)
./ (the current directory)
$FEMIS_ETCDIR (if set)
$FEMIS_HOME/etc
/home/femis/etc
```

By setting the `FEMIS_ETCDIR` directory, you have made it possible for the script to find the configuration files without having to use the `-etc` command line option. In other words, you do not have to type:

```
% femismon.sh -etc /home/femis/etc.3x1
```

You can simply type:

```
% femismon.sh
```

The "swap3x1" alias allows you to switch temporarily to the 3x1 configuration. The "swap8x8" alias allows you to switch temporarily to the 8x8 configuration. The "unswap" alias temporarily unsets the `FEMIS_ETCDIR` environment variable.

2.4 Checking the FEMIS Startup

To check the FEMIS startup, the server will need to be rebooted and FEMIS programs need to be verified that they are running correctly.

2.4.1 Rebooting the Server (as root)

To activate some of the system-level changes that the FEMIS UNIX Installation script makes, reboot the server.

1. Login as `root`.
2. Enter the following on a Solaris machine:

```
# /etc/init 6
```

As the server reboots, note the status messages during the startup of the FEMIS processes.

2.4.2 Verifying the FEMIS Programs (as femis)

After the server has rebooted, verify that the FEMIS programs are running.

Login as `femis`.

For an NxN configuration, there should be one FEMIS Notification Server process running. For an Nx1 configuration, there should be N of them running.

```
% ps -ef | grep femis_event
```

If it is not running, restart it with logging turned on.

```
% startnotify -log
```

Then use the Show Notify utility.

```
% shownotify aux
```

Refer to Section 5.0, FEMIS Notification Service, for more information.

If DEI is supposed to be running, check it also.

```
% ps -ef | grep femisdei
```

If it is not running, check the log file `./log/femisdei.log`, to see what happened. The most common problem occurs when DEI cannot connect to Oracle. Check the configuration file, `./etc/femisdei.cfg` and restart DEI by typing `femisdei`. Refer to Section 8.0, FEMIS Data Exchange Interface (DEI), for more information.

2.5 Utility to Add FEMIS User Account to Databases

The `adduser` utility enables you to add a FEMIS user account to all the databases. To use the utility, follow the procedure in the example, substituting the new user name for "wayne".

To create an account for "wayne," complete the following steps:

1. Login as `femis` on the UNIX server.

2. Run the following script.

```
% adduser.sh -user wayne -run
```

This script will create and run an SQL script to add the user to the database and give the new user all privileges. It takes a long time to run.

The script does the following:

1. Adds a mostly empty record for the user to the `PERSON` table
2. Adds a record to the `FEMIS_USER` table
3. Adds many records (>200) to the `USER_MODE_PRIV` table.

You should then be able to login to FEMIS on the PC as the new user (wayne).

2.6 Non-Standard Database Topologies

If you need to create a non-standard database topology (i.e., not Nx1 or NxN), the following section describes the required steps.

First, run the Build Topology program to create an NxN configuration. Because you will be placing more than one EOC database on a server, you must use fake server names and listeners.

For example, to create a 3x2 with the TEAD and CTOO databases on one server (`TCEMSUN` using `fi6`) and UTST on another (`CEMSUN` using `fi8`), actually create a 3x3 and temporarily put TEAD on a non-existent server, say `TESTSUN` using listener `fx0`. The following is what the EOC List file looks like.

```
tead tead testsun    fx0    Y    1 9020 ctoo,utst
ctoo ctoo tcemsun    fi6    N    2 9020 tead,utst
utst utst cemsun     fi8    N    3 9020 tead,ctoo
```

Then run the Make Configuration program to create the SQL scripts.

Next edit the EOC List file and convert it to a 3x2 configuration. Remember to also change the notification ports using different numbers for each, such as the following:.

```
tead tead tcemsun    fi6    Y    1 9021 ctoo,utst
ctoo ctoo tcemsun    fi6    N    2 9022 tead,utst
utst utst cemsun     fi8    N    3 9023 tead,ctoo
```

Now you are ready to begin converting the 3x3 scripts to a 3x2 topology.

1. Change all instances of `fx0` to the name of the listener on the server with the CTOO database (i.e., `fi6`). The following shell script does this.

```
#!/bin/sh
for i in `grep -l 'fx0' *.sql`
do
    echo "Processing: $i"
    sed -e 's/fx0/fi6/g' $i >$i.tmp
    mv $i.tmp $i
done
```

2. Edit EOC-specific scripts and keep necessary "connects."

```
if XXXX=ctoo => ctoo/ctoo@fi8
if XXXX=tead => tead/tead@fi8
if XXXX=utst => utst/utst@fi6
```

3. Edit server-specific scripts and keep necessary "connects."

```
if SERVER=testsun => utst/utst@fi6
if SERVER=tcemsun => utst/utst@fi6
if SERVER=cemsun  => ctoo/ctoo@fi8, tead/tead@fi8
```

4. Edit the Master Create Database scripts and make sure the correct `@cr_data_owner.sql` or `@cr_data_user.sql` script is called for each account.

5. Edit the Create Snapshot scripts (`cr_XXXX_ss.sql`) and change the `GRANT SELECT` statements.

```
if XXXX=ctoo, grant to utst
if XXXX=tead, grant to utst
if XXXX=utst, grant to ctoo,tead
```

6. Edit the Create View scripts (`cr_XXXX_view.sql`) and add `GRANT SELECT` statements.

```
if XXXX=ctoo, grant to tead
if XXXX=tead, grant to ctoo
if XXXX=utst, do nothing
```

Files Created by the Make Configuration Program are listed in the following table.

FIX	cr_XXXX_ss.sql	(1),(4)
FIX	cr_XXXX_ss_groups.sql	(1)
FIX	cr_XXXX_view.sql	(5)
FIX	dr_XXXX_ss_groups.sql	(1)
FIX	master_cr_db_SERVER.sql	(3)
FIX	master_cr_newrep2.sql	(1)
FIX	master_dr_newrep2.sql	(1)
FIX	master_dr_ss.sql	(1)
FIX	master_refresh.sql	(1)
FIX	master_rep_fix.sql	(1)
FIX	master_rep_start.sql	(1)
FIX	master_rep_stop.sql	(1)
FIX	rep_fix_eoc_XXXX.sql	(1)
FIX	rep_fix_SERVER.sql	(2)
FIX	rep_start_eoc_XXXX.sql	(1)
FIX	rep_start_SERVER.sql	(2)
FIX	rep_stop_eoc_XXXX.sql	(1)
FIX	rep_stop_SERVER.sql	(2)

3.0 FEMIS PC Installation

The following sections describe the steps needed to install FEMIS on a PC.

3.1 Installing the PC COTS

The order for installing the COTS on a new FEMIS PC is as follows:

1. Windows NT v3.51
2. Hummingbird NFS Maestro v5.1.1
3. Oracle SQL*Net for PC v2.0
4. Oracle ODBC v2.0
5. ArcView v3.0
6. Microsoft Project v4.0 for Windows

Installing the following COTS products is optional.

Word processor	(if applicable)
Spreadsheet	(if applicable)
Graphics presentation	(if applicable)

3.1.1 Installing Windows NT and NT Service Pack

FEMIS currently uses Windows NT v3.51 and NT Service Pack 5.

Installing Windows NT is not a trivial process and there are many possibilities for error. To reduce the risk of failure, this section offers several guidelines for installing Windows NT on a PC workstation.

3.1.1.1 Issues to Address Before Installation

You should consider the following before beginning Windows NT installation.

Hardware Requirements
There are two sets of information which you must consider regarding hardware requirements for Windows NT. First, you must check the *Windows NT Hardware Compatibility List* (HCL) published by Microsoft. This document covers every type and model of hardware that has been tested for compatibility with Windows NT. The list is updated regularly and can be accessed at Microsoft's World Wide Web site (http://www.microsoft.com/BackOffice/ntserver/hcl/hclintro.htm). Check the HCL to verify that every major component of your computer system is compatible with Windows NT. If

one or more components are not listed, contact Microsoft or the hardware vendor to see if new drivers or compatibility aids are available. If not, you should think twice before installing Windows NT on this computer.

The second requirement that must be considered is minimum hardware requirements. If your computer **does not meet these minimum requirements**, it is unlikely that Windows NT will work acceptably on this system.

FEMIS Hardware Requirements for Windows NT

CPU	Intel 486/100 or better, Pentium recommended
RAM	32MB required
Hard disk storage	800MB minimum, 1.2GB recommended
Display adapter	VGA-compatible or better

Hardware on Your System

At several points during the Windows NT installation you will be prompted for information about the hardware in your system and its connections to networks and printers. The Windows NT installation program is **not very tolerant of mistakes**, so it is important to know this information before you start.

Item	Example	Notes
Computer model and manufacturer	Dell OptiPlex DGX 590	
Processor type	Intel Pentium, 90 MHz	
Hard disk model, size, manufacturer, interface type	Seagate ST31230N, 1010MB, SCSI interface	
CD-ROM model, manufacturer, interface type	NEC CDR-511, SCSI interface	
Disk adapter type(s), model, and manufacturer	SCSI: NCR 53C810 (PCI) IDE: generic	
Display adapter type, model, and manufacturer	ATI Mach 64, 2MB DRAM	
Network adapter type, model, and settings	3Com EtherLink III (PCI), model 3C590 Rev. C, auto-configured	
Printer model, manufacturer, and interface type	HP Laser Jet Series II, attached to parallel port 1	
Computer name	FEMISPC01	15 character maximum
Computer owner name	FEMIS Test Lab	Cannot change later
Primary user account name	FEMIS_USER	20 character maximum
Network domain or workgroup name	FEMISTEST	
Network user name and password	Username: Password:	
Network addresses	IP address: Default gateway: Primary WINS: DNS server:	

Multi-Boot
Windows NT can coexist with other operating systems, including MS-DOS, Windows for Workgroups, and Windows 95. The NT installation program can detect these operating systems and include them on the NT bootup menu. However, MS-DOS and 16-bit Windows are only supported if they were installed first, before Windows NT. Installing them afterward is strongly discouraged by Microsoft and can cause unreliable NT operation.

3.1.1.2 Windows NT Installation Tips

Installing Windows NT can be a very intimidating experience. There are many points where the operator must make a choice, but very little information is available about how to choose or the potential consequences of a choice. Fortunately, this problem is not insurmountable. If you plan ahead and collect the necessary information before you begin, the installation process is much easier.

Modular Installation
For best results break the Windows NT installation process into several modules, rather than trying to install everything at once. This approach reduces complexity and allows you to test each module as it is completed. Thus, there is less possibility for error, more opportunity to detect errors early, and less work to redo if errors are found.

Module	Description
Basic operating system	Operating system, hardware drivers, file system, administrative tools
Networking	Network support, network card drivers, network user accounts
Printer support	Printer drivers, printer connections

To install these modules separately you **must select Custom installation**, not Express installation. Custom installation allows you to select which components will be installed and where they are located, while Express installation makes many assumptions and attempts to install everything in one pass. If you have already collected the hardware and network information specified in the Hardware Requirements section above, Custom installation is not more difficult than Express installation.

After you select Custom installation, you will be given the following installation options:

[ ] Set Up Only Components You Select
[ ] Set Up Network
[ ] Set Up Local Printer
[ ] Set Up Applications on the Hard Disk

For modular installation, enable the **Only Components You Select** option and disable the others so you will be able to install network and printer support later, as separate modules.

Storage Device Detection
During the Hardware Setup phase, the NT installation program displays a list of mass storage devices found on your computer. This list includes SCSI adapters and CD-ROM devices but **does not include** IDE components. Do not worry--IDE devices are indeed recognized and will be supported by the installation.

3.1.1.3 Installing Windows NT

Note: Before you install Windows NT from the FEMIS PC COTS CD, **read Section 3.1.1.1, Issues to Address Before Installation, and Section 3.1.1.2, Windows NT Installations Tips.**

Insert the FEMIS PC COTS CD into the CD-ROM drive.

Note: The **CD-ROM drive is usually your `D:` drive** and will referred to as the `D:` drive in the following instructions.

From an MS-DOS prompt, type

```
D:\NT351\WINNT/B
```

All the necessary Windows NT files will be copied to your hard drive, and the Windows NT installation process will begin.

3.1.1.4 Installing Windows NT Service Pack

The Windows NT v3.51 Service Pack 5 is needed to successfully run the date/time clock and to successfully run FEMIS v1.3.

From the `File Manager`:

1. Copy all the files in `D:\NT351SP5` to `C:\NT351SP5`.
2. Run the `C:\NT351SP5\UPDATE.EXE` program.
3. Click `OK` on the setup message box that pops up, and the service pack will be installed.
4. Reboot your PC when installation has been completed.

Special care must be taken to protect the `C:\NTLDR` and `C:\NTDETECT.COM` files against accidental damage. Windows NT will not run without them. If you **cannot** see these files using the File Manager, then they are already hidden and read only; they are protected.

If you can see the files using the File Manager, complete the following steps to protect them.

1. Select `C:\NTLDR` and `C:\NTDETECT.COM`.
2. Press `Alt-Enter` to display the File Properties form.
3. Select the `Read Only, System, Hidden`, and `Archive` attributes.

4. Click OK to apply the attributes.

These files are now invisible and safe from accidental deletion.

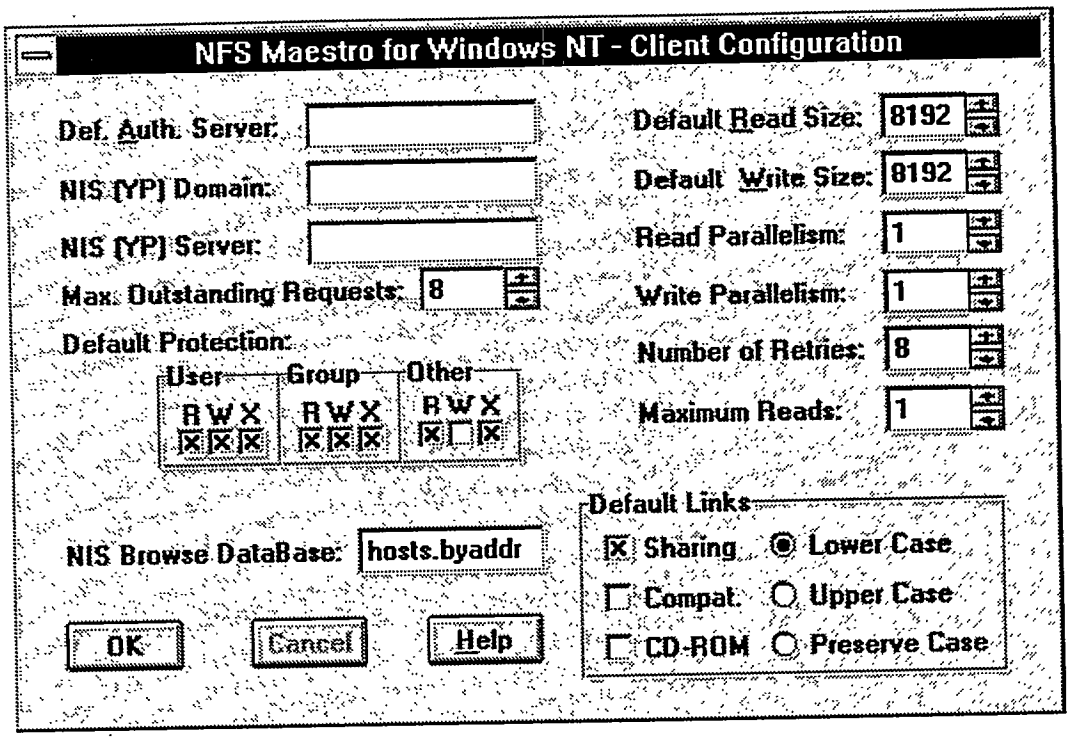
Once the Service Pack is installed, the Windows NT installation is complete.

3.1.2 Installing Hummingbird NFS Maestro

1. Login to Windows as `Administrator`.
2. Run `D:\MSTRO511\SETUP.EXE` file from the FEMIS PC COTS CD.
3. The first window asks you to close any applications you have running. After closing all other applications except Program Manager, click the OK button.
4. The second window asks you to specify the setup type. Click the `Personal and Express` radio buttons, and then click OK.
5. When prompted to perform a shared installation, click `Yes`.

   Note: If you are installing from an older version, you will be prompted with for an installation type. Select `Complete`.

6. Specify the Maestro installation directory. Click OK to accept the default of `C:\WIN32APP\MAESTRO`.
7. Specify your Maestro user directory. Click OK to accept the default of `C:\WIN32APP\MAESTRO\USER`.
8. Confirm all your selections, and click `Start` to begin your Maestro installation.
9. Create a common program group by clicking OK.
10. Configure the NFS client to match the NFS Maestro for Windows NT window, and then click OK.
11. Once the installation is complete, click OK.
12. Click `Yes` to reboot, and then login to Windows NT.

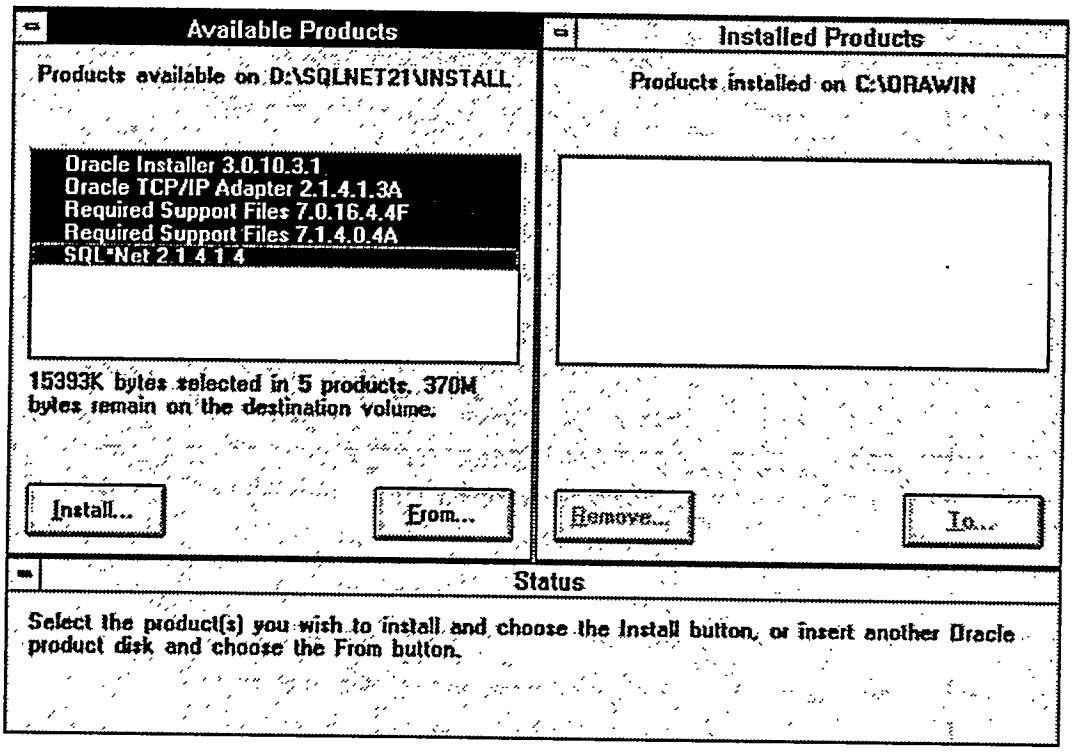


3.1.3 Installing Oracle SQL*Net

Oracle SQL*Net v2.0 is used for FEMIS v1.3. Insert the FEMIS PC COTS CD into the CD-ROM drive.

1. Login to Windows NT as `Administrator`.
2. Run the `D:\SQLNET21\INSTALL\ORAINST.EXE` program.
3. Enter an appropriate name when prompted for a customer name.
4. Click OK to accept the default Oracle installation directory of `C:\ORAWIN`.
5. Select `All Available Products`, and click the `Install` button.

   Note: When prompted to update, select `Yes`.



6. Select `Microsoft NT 3.0, 3.5` for your TCP/IP vendor, and click OK.

7. Click `Exit` under the `File` menu to exit.

To add the Oracle environment variables, complete the following steps:

1. Open Windows NT Program.

2. Open the Windows NT Control Panel.

3. Select `System`.

4. Add the System Environment Variables with the value of `ORACLE_HOME` to `C:\ORAWIN`.

5 Click the `SET` button to save this change.

6. Add `%ORACLE_HOME%\BIN` to the System Environment Variable path, and click the `SET` button.

7. Click OK to exit.

Adding NetTest (Optional)

To add NetTest to the Oracle program group, complete the following steps:

1. Go to the Oracle program group.
2. Open the Program Manager.
3. Click on `Oracle, File, New`, and then `Item`.

   The following prompts will be displayed

   Description: `NetTest`
   Command: `C:\ORAWIN\BIN\NETTEST.EXE`

Installation is complete, and the SQL*Net will be tested after the FEMIS database is installed.

3.1.4 Installing Oracle ODBC

Oracle ODBC v2.0 is used for FEMIS v1.3. Insert the FEMIS PC COTS CD into the CD-ROM drive.

1. Login to Windows NT as `Administrator`.
2. Run the `D:\ODBC200\SETUP.EXE` program.
3. Click `Continue` to install Oracle7 ODBC.
4. Select the `ORACLE7` driver and click `OK` to begin installation. The system loads the drivers and creates an ODBC program group.
5. Click `Close` on the Data Source window.
6. Click `OK` to exit the ODBC installation setup.

Adding ODBC Test (Optional)

A test program can be installed to verify that the Oracle setup for SQL*Net and ODBC are correct. To add ODBC Test to the ODBC program group, complete the following steps:

1. Go to the ODBC program group
2. Click on `File, New`, and then `Item`.

   The following prompts will be displayed

   Description: `ODBC Test`
   Command: `C:\WINNT35\SYSTEM\ODBCTST.EXE`.

3. Click OK to exit.

The ODBC installation is complete.

3.1.5 Installing ArcView

ArcVeiw v3.0 is used for FEMIS v1.3. Insert the FEMIS PC COTS CD drive.

To install ArcView, complete the following steps:

1. Login to Windows NT as `Administrator`.

   Note: Remove older versions of ArcView before installing version 3.0. Verify that no other applications are running before you proceed with the installation.

2. Run the `D:\AV_GIS30\AVSETUP\SETUP.EXE` program.

3. Click `Next` on the Select Program Folder to accept the defaults and to begin the ArcView installation.

4. Click OK on the Information window to exit the ArcView installation.

5. Select the `Yes` radio button to restart your computer, and then click the `Finish` button.

6. Run ArcView from the Program Manager to register the application for each new installation on a PC.

3.1.6 Installing Microsoft Project

Microsoft Project v4.0 is used for FEMIS v1.3. Insert the FEMIS PC COTS CD into the CD-ROM drive.

1. Login to Windows NT as `Administrator`.

2. Run the `D:\PJ40WIN\SETUP.EXE` program.

Microsoft Project should be installed using the standard product installation notes provided with the software.

3.1.7 Installing Novell GroupWise from the FEMIS Data Server

Note: Before installing the GroupWise Client, the server portion of Novell GroupWise E-mail must have been installed and configured (see Section 2.1.4, Installing Novell GroupWise).

Note: FEMIS must be installed on the PC before you install Novel GroupWise.

To install the GroupWise Client, complete the following steps:

1. Verify drive `l:` is connected to the FEMIS data server mail directory.
2. Run `l:\setupwin.exe` to install the GroupWise Client.

To configure the GroupWise icons, complete the following steps:

1. Select the GroupWise icon in the GroupWise program group.
2. Choose `File|Properties` from the Program Manager menu.
3. Add the parameter `/@u-?` at the end of the command line. This parameter forces GroupWise to prompt the user for a User ID (i.e., mailbox name) when entering mail, rather than defaulting to the NT username.
4. Repeat Steps 1 through 3 for the Notify icon.

Update the FEMIS Initialization files to point to GroupWise.

Run `C:\FEMIS\FIXINI.EXE`.

If you try to send an E-Mail message while in another application using `File->Send->GroupWise`, you will receive the error message "Mail could not connect to your mail server." Your system will try to open Microsoft Mail, and you will receive a message about signing into Microsoft Mail.

To correct this connecting problems, the `MAPI.DLL` file in `C:\WINNNT35\SYSTEM 32` needs to be replaced. First, rename the `MAPI.DLL` file in `C:\WINNNT35\SYSTEM 32` (e.g., `MAPI.OLD`), in case you want to use this file later (do not delete it). Copy the `MAPI.DLL` file from `C:WINNT35\SYSTEM` to `C:\WINNNT35\SYSTEM 32`.

Note: If GroupWise or Notify were running when FEMIS was started, it will not close them no matter what preferences are set under `File-> Preferences->Close EMail` and `Notify When Exit`. If a different mail package is used, the `FEMIS.INI` file will never close the mail package. Any command line parameters to the E-Mail package will now be used by FEMIS. If the string `%FEMISUSER%` is used in the command line, the current FEMIS username will be substituted when the program is called.

3.1.8 Installing Other COTS

The following COTS products should be installed using the installation documentation for each product.

Word processor **(if desired)**
Use the standard product installation notes provided with the software.

Spreadsheet **(if desired)**
Use the standard product installation notes provided with the software.

Graphics Presentation **(if desired)**
Use the standard product installation notes provided with the software.

3.2 Installing the FEMIS PC Software

This software is for the PC workstations that are connected to the FEMIS data server and contains the FEMIS client software and a collection of GIS theme files. The installation of the FEMIS client software assumes separate installations of the necessary COTS software have been completed.

The FEMIS client software can be installed over the network from a UNIX server onto any FEMIS PC workstation. The client software contains over 120 files representing more than 20MB of file space. Check the Release Notes for actual space required for GIS data for your site.

The following executable files will be installed by FEMIS

`ASSIGN.EXE`	-	Used by Microsoft Project in planning mode
`D2PCI.EXE`	-	D2PC model program
`FDATAMGR.EXE`	-	Database administrator
`FEMIS.EXE`	-	Main FEMIS program
`FEMISCHK.EXE`	-	Checks VBXs and DLLs for the correct version
`FIXINI.EXE`	-	Automatic `FEMIS.INI` fixer
`FMD2I.EXE`	-	FEMIS D2PC plume model interface
`FMETSIMW.EXE`	-	Met Data Injector
`FMEVAC.EXE`	-	FEMIS ESIM evacuation interface
`FMODSB.EXE`	-	Model results status board
`FMONPC.EXE`	-	FEMIS Monitor for the PC
`FSYSMGR.EXE`	-	FEMIS System Admin utility
`FUNITCVT.EXE`	-	FEMIS Unit converter
`FVERSUB.EXE`	-	Used by `FEMISCHK`
`FWATCH.EXE`	-	FEMIS Watcher of notification sent by `FEMISMON` to PC
`FXCOMMPC.EXE`	-	FEMIS-Met server
`INSTSRV.EXE`	-	Installer for NT Services
`KEYPRINT.EXE`	-	Screen print utility
`METSIM.EXE`	-	Met simulator
`MKSETUP.EXE`	-	Setup program creator
`NOTITEST.EXE`	-	Notification test program
`PARDOS3I.EXE`	-	PARDOS model program
`PICKLIST.EXE`	-	Used by Microsoft Project in planning mode
`REG2INI.EXE`	-	Copy data to `FEMIS.INI`
`SETUP.EXE`	-	FEMIS Setup program

SETUPGIS.EXE	-	GIS data installation program
SRVCTL.EXE	-	Installer for NT Services
SWITCHDB.EXE	-	Change default EOC
SYSENV.EXE	-	Add system environment variables
WINECHO.EXE	-	Give Messages from a NT-DOS box
XNTPD.EXE	-	Network Time Protocol client
FEMIS.HLP	-	Online help for FEMIS
SETUP.HLP	-	Help for setup and utilities.

These executable and other support files will be loaded to the following locations:

1. Your current WINDOWS directory
2. In the SYSTEM subdirectory
3. In the FEMIS directory
4. ORAWIN directory.
5. Microsoft Project directory

3.3 Configuring the FEMIS Setup Program

Note: Configure the FEMIS Setup Program before the installing on the first PC.

The FEMIS Setup program uses a configuration file to determine what to install, where to find and install files, and the defaults for the installation. To simplify the installation process, it is useful to edit the I:\PC\FSETUP.INI file so that the defaults used by the setup program will be correct and you will just have to click OK without changing any options.

The first section of the INI file is the only one that should be edited. Starred items (*) are those that you should edit.

TimeZoneOffset	Minutes this time zone is from Greenwich mean time (GMT). This is not currently used.
Site*	Default site code. This should be changed to be your site code (Uppercase.)
EOC*	Default EOC code. This should be changed to be your EOC code (Uppercase.)
DBPassword*	Default EOC's database password. This can be changed to be the database password.

Note: If there are any security concerns, DBPassword should not be used (change it to blank). The FSETUP.INI file will be copied to all PCs during

installation and would contain an unencrypted password. If DBPassword is blank, you will have to enter the password in the SETUP program on each PC.

SourceDir	Default installation source directory. Normally should be left as I:\
DestDir	Default installation destination directory. Normally should be left as C:\FEMIS\
Install*	Default installation type. Should be changed to either Full or Upgrade, depending on the type of installation that should be the default for each PC.
InstallConfigd*	If Upgrade, whether the Install Configuration Files checkbox should be initially checked (Y or N)
DevIcons	Include development icons for some extra sub programs. Normally should be N.

In the fsetup.ini file, verify in the [Configd] section that the ODBC.INI and TNSNAMES.ORA. lines are not commented out with semicolons. If commented out, remove the semicolon and the blank File000#=line for the same number.

The remaining sections in FSETUP.INI include lists of files to be copied and some batch files to be executed. These should not normally be changed at all, and should only be done by someone who is familiar with FEMIS and FEMIS directory structures.

To add more files to be copied, add to the end of the list with the next increasing number:

File####=(source path for file) (destination path for file)

Leave a single blank space between the source and destination files.

To remove files, remove all the information after the equals "=" sign. Do not remove the entire line or the setup program will think it is done and not copy any files after the removed number.

To execute a command, use the following:

Run##=(command)	To execute a command and wait until it finishes before continuing.
Shell##=(command)	To execute a command and continue with the rest of setup without waiting for it to finish.

For all the above commands in FSETUP.INI, the following variables will be replaced in the command before it is executed.

Note: All directory variable replacements will end in a backslash (\).

Variable	Description	Example of replacement value
%SITE%	Current Site	TEAD, UMDA
%EOC%	Current EOC	CTOO, ORST
%DESDIR%	Destination	C:\FEMIS\
%SRCDIR%	Source	I:\
%WINDIR%	Windows	C:\WINNT35\
%WINSYSDIR%	Windows\System	C:\WINNT35\SYSTEM\
%WINSYS32DIR%	Windows\System32	C:\WINNT35\SYSTEM32\
%ORACLE_HOME%	Oracle SQL*Net	C:\ORAWIN\

The following shows which of the sections in the INI file are used by the different setup options.

Full	[FEMIS EXEs], [FEMIS Misc], [Configd], [FEMIS System]
Upgrade	[FEMIS EXEs], [Configd] (if "Copy Configuration Files" checkbox is checked)
MetSim	[Met Simulator]
MetServer	[Met Server], [Configd]
Config Files	[Configd]
System Tools	[FEMIS System Tools] (if "Install System Tools" checkbox is checked)

3.3.1 Configuring Files

Several other files must be configured for your site or EOC. These files should have been configured by the FEMIS UNIX installation script, but should be verified before installing on the FEMIS PCs.

Note: Directories specified below are from the PC. You will need to use the UNIX version of these directories if you are editing files from the UNIX server. See instructions above for connecting the I: drive.

3.3.1.1 I:\CONFIGD\HOSTS

The HOSTS file needs to be configured with the correct host names and IP addresses. This file should be a copy /etc/hosts.

3.3.1.2 I:\CONFIGD\TNSNAMES.ORA

The TNSNAMES.ORA file needs to be configured with the correct database names, listeners, and IP addresses. On the server, this file should be a copy of $TNS_ADMIN/TNSNAMES.ORA. For each listener on each server, this file should contain a section like the following. These will be used as the "Server" in the ODBC.INI file. (The parts in *Italics* are what should be changed):

```
fi_ctoo =
  (DESCRIPTION =
    (ADDRESS_LIST =
        (ADDRESS =
```

```
          (COMMUNITY = TCP)
          (PROTOCOL = TCP)
          (HOST = ctoosun.utah.gov)
          (PORT = 1521)
        )
    )
    (CONNECT_DATA =
      (SID = fi_ctoo)
    )
  )
...
```

The appropriate files will be copied by the PC installation.

3.3.1.3 I:\CONFIGD\ODBC.INI

The `ODBC.INI` file needs to be configured with the correct database names, listeners, and driver paths. Each EOC code for a site should be listed under the [ODBC Data Sources] section. And each EOC should have it's own section that contains a Driver, Description and Server. (The parts in *Italics* are what should be changed):

```
[ODBC Data Sources]
CTOO=Oracle7
...

CTOO]
Driver=C:\WINNT35\SYSTEM\SQORA7.DLL
Description=Tooele County EOC
Server=fi_ctoo
...
```

The driver path should be left as `Driver=C:\WINNT35\SYSTEM\SQORA7.DLL` so the setup program will fix it to be the correct directory for the PC being installed.

The description is a name for the EOC.

The server is the instance name of the Oracle listener. Every server specified in the `ODBC.INI` file should have an entry in the `TNSNAMES.ORA` file.

3.3.1.4 I:\CONFIGD\NETFEMIS.BAT

The `NETFEMIS.BAT` file needs to be configured with the correct host and partitions for connecting to the `L:` and `M:` `NFS` drives.

The lines beginning `nfs link l:` and `nfs link m:` must have the correct server name, partition, and directory. (Parts in *Italics* are what should be changed):

```
nfs link m: \\<hostname>\/<partition>/home/femis/user  /l:s
nfs link l: \\<hostname>\/<partition>/apps/grpwise/po  /l:s
```

3.3.1.5 I:\CONFIGD\NTP.INI

The `NTP.INI` file needs to be configured with the correct IP address for the time server.

The line beginning `server` must have the IP correct address for the NTP server.

Note: If the line `driftfile c:\ntp\driftfile` is not changed, it will be fixed by the setup program to be a valid directory on the PC.

3.3.1.6 I:\PC\FEMTOOLS\FEMIS.DB

To configure the servers and routers to match your network configuration, run

```
I:\PC\FEMTOOLS\WS_WATCH I:\PC\FEMTOOLS\FEMIS.DB
```

Then save the configuration.

See the WS_WATCH Online Help if you need assistance.

3.3.2 Installing FEMIS Client Software

All files needed by the installation process should have previously been copied from the release tape or CD to the server. The files specified above should have been configured or verified that they are configured correctly for the site and EOC.

These instructions assume familiarity with normal Windows operations (using menus, buttons).

Do not install the GIS data on more than one PC at a time. If you do, there may be problems with file sharing and NFS, resulting in an incomplete and corrupted installation of the GIS data on the PC.

Note: FEMIS expects the GIS data to be located at `C:\FEMIS\GIS`. If you need to put the GIS in another directory, the ArcView project file (`APR`) must be rebuilt. Instructions for rebuilding an `APR` are located in the Section 9.4, Customizing the FEMIS Map.

3.3.2.1 Preparation

To prepare for starting to install FEMIS:

1. Login to Windows NT as `Administrator` or an account that has administrator privileges, or some of the steps, such as starting the NTP service to synchronize the PC's time and creating common program groups, will not work.

2. Verify that all COTS needed by FEMIS are installed on the PC. At the minimum, the following should be installed (the setup program will also verify that these are installed). You should also consult the ***FEMIS Bill of Materials (BOM)*** and verify that the correct versions of the software products are installed.

- Novell GroupWise
- Oracle ODBC
- Oracle SQL*Net
- Microsoft Windows NT
- Hummingbird NFS Maestro
- ESRI ArcView GIS
- Microsoft Project.

3.3.2.2 Connect Network Install Drive

To connect the FEMIS network drive to the install directory, complete the following steps. (Parts in *italics* are what should be changed):

- Obtain the path `\\<hostname>\/<partition>/home/femis` from your System Administrator.
- Open the Windows File Manager.
- Select on the `Disks->Connect Network Drive` menu option, and the Connect Network Drive window appears.
- Drive field: Select drive letter `I`.
- Path field: Type `\\<hostname>\/<partition>/home/femis`.
- Connect As field: Type `femis`.
- Click OK, and the Enter Network Password window appears.
- Password field: Type `femis`.
- Click OK, and the Enter Network Password window disappears. A new File Manager window will appear when the connection is successful.

3.3.2.3 Installing GIS Data

The `SETUPGIS` installs a selected set of GIS data onto a PC. This program allows you to have different sets of data to install on different PCs.

3.3.2.4 Setting up SETUPGIS

Verify that the `SETUPGIS.INI` file contains a section for each set of data you wish to have available to be installed. The file contains the various options for installing the FEMIS GIS:

`GISName##=`	The name to show the user for the GIS in the `SETUPGIS` program.
`GIS_INI##=`	The `INI` file for the APR (processed to get the files to install) will be renamed to `%DESDIR%GIS\FEMISGIS.INI`
`GIS_APR##=`	The APR for this GIS data will be renamed to `%DESDIR%GIS\FEMISGIS.APR`

`GISPath##=` Subdirectory path to add to the drive to get to the data to be installed. Normally, `I:\` will be the drive. `GIS\` will probably be correct, but may be different if more than one site's data is available for selection.

Note: This path **MUST** end in a backslash ("\").

`APR_Empty##=` The APR is "Empty." If it is Empty, then ArcView will be started to build the `FEMISGIS.APR` from the empty APR. FEMIS is released with an empty APR that will work with any `INI` file to create `FEMISGIS.APR`.

Example:

```
GISName00=GIS for site ANAD
GIS_INI00=%SRCDIR%GIS\ANAD_APR\FEMISGIS.INI
GIS_APR00=%SRCDIR%GIS\ANAD_APR\FEMISGIS.APR
GISPath00=GIS\ANAD\
APR_Empty00=Y
```

Adding More Options of Data to Copy

To add more options of data to copy, complete the following:

- Copy the `FEMISGIS.INI` file to another name in the same directory (e.g., `I:\GIS\<SITE>-APR\X.INI`)
- Edit the new `FEMISGIS.INI` to either add new layers or delete existing layers, or make whatever changes you desire.
- Edit the `I:\PC\SETUPGIS.INI` file. Copy the section for the old `SETUPGIS.INI` file, change the `SETUPGIS.INI` file name and the *##* fields. The new option should be available from the `SETUPGIS` program when it is run again.

Installing GIS Data onto a PC

To install the GIS data onto a PC, complete the following steps:

1. Connect the `I:` network drive as described in Section 3.3.2.2, Connect Network Install Drive.
2. Run the `I:\PC\SETUPGIS` program.
3. Select the data to install from the drop-down list. The program will calculate the amount of space that is required. If this PC already has GIS data, you can either delete it before installing more data, or check the `Copy only changed files` option that will only copy the files that are different than the ones on the PC.
4. If you have the data and options you want, click `OK`.

5. An MS-DOS window will display and show the progress as the data is copied. This process may take quite a while, depending on how much data is being copied. Press any key when it is done.

6. If an "Empty" APR was copied, ArcView will be started after all data is copied to generate the real APR, which will take several minutes. Close ArcView when it is done generating the APR.

3.3.2.5 Setup Program

The FEMIS Setup program installs and configures most files for use with FEMIS. You will be given the option to select the type of installation to perform on this machine (`Full` vs. `Upgrade`), and you can also make this machine a Met server or Met simulator by using these same steps and selecting those options from the Setup program.

It will not cause problems to run the setup program multiple times on the same PC.

1. In File Manager, select the `I:` drive (connected above).

2. Select the PC directory.

3. Run the `SETUP.EXE` program.

4. Verify that the defaults shown on the "FEMIS Setup Options"window are correct (the online help describes the options). If you configured the `FSETUP.INI` file correctly then all the default options should be correct (you may need to enter the database password).

   This step is the only point at which an Upgrade of an existing FEMIS PC installation and a Full installation on a new FEMIS PC are different. For Full versus Upgrade, the appropriate option should be selected on this window. If you are installing an upgrade you may wish check the checkbox to recopy all the configuration files (`NTP.INI`, `ODBC.INI`, `TNSNAMES.ORA`, `TNSNAV.ORA`, `SQLNET.ORA`, and `HOSTS`.)

5. Click `OK` if all the options on the Setup form are correct. If any are not correct, either change them here, or click `Cancel` and change them in the `I:\PC\FSETUP.INI` file.

   The setup program will determine if enough disk space is available to install all the options selected. If enough space is not available, you will be allowed to cancel (so you can free up disk space) or continue anyway. Otherwise, files will be copied.

   The setup program will take several minutes to copy all the files.

   If the setup program appears to be hung up, use `Alt-Tab` to see if any MS-DOS windows are waiting for you to press a key.

   You will next be shown a window to select which FEMIS programs should have icons in the Program Manager. Select the options desired from the Program Icons screen. You should at least leave the default options selected, but you may wish to have additional icons for FEMIS programs. When you have the options desired, click `OK`. Clicking `Cancel` will add no icons, but the setup process will continue.

The next part of the setup program will take several minutes to configure the PC. You may receive prompts or setup may wait for confirmation before performing some items. Watch and click OK or press return as needed.

- Updates the `FEMIS.INI` for the PC name and COTS paths.
- Updates the `ODBC.INI` to have the correct paths.
- Updates the `NTP.INI` to have the correct server.
- Starts the NTP service to synchronize the time with the server.
- Sets up the system to use FEMIS's own `GLOBAL.MPT` file with Microsoft Project.
- Updates the `FEMIS.INI` file for the directories where FEMIS was just installed.
- Updates the `FEMISDB.INI` file for the default EOC database selected.
- Removes any obsolete files from older FEMIS installations.
- Attaches the local database so Microsoft Project can be used in planning mode.
- Verifies required COTS packages are installed.
- Prompts the user with the current time zone so that they can verify it is correct. (If the time zone is not correct, click on the `Control Panel` icon, and then use `Date/Time` to fix it.)
- Adds FEMIS environment variables, if needed.
- Registers OCX controls used by FEMIS.

3.3.2.6 Startup Group in Program Manager

The setup program is not able to guarantee that the batch file to connect the network drives (`Run FEMIS Setup Files`) will be added to the correct Startup group in the Program Manager. This item should normally be in the common Startup group, not a personal Startup group.

1. Look at the `Startup (Common)` group in Program Manager. If it contains an icon for `Run FEMIS Setup Files` skip to the next section.
2. If the `Startup (Common)` program group does not exist, select the `New` under the `File` menu within Program Manager.
3. Select `Common Program Group` from the `New Program Object` window that appears and click OK.
4. Enter `Startup` as the description of the new program group at the `Common Program Group Properties` window and click OK.

5. Move the `Run FEMIS Setup Files` icon from the `Startup` group to the `Startup (Common)` group.

3.3.2.7 Verify Temporary Directory and Environment Variables

The GIS and other programs need a directory to store temporary files. Use the following steps to verify that this process was completed correctly by the Setup program.

1. The directory `C:\TEMP` should exist on the PC. (It should have been created by the Setup program if it did not already exist.)

2. From the Program Manager, select `Control Panel`.

3. Select the `System` option.

4. If a `TEMP=something` (usually `C:\TEMP`) does not exist in the System Environment Variables box at the bottom of the `System` window, enter `TEMP` in the upper box and `C:\TEMP` in the lower box and click the `Set` button.

5. Determine the directory where Oracle SQL*Net software was installed on this PC. (Usually `C:\ORAWIN`). Verify that in the System Environment Variables box the `ORACLE_HOME=something` (usually `C:\ORAWIN`) is the correct directory where Oracle SQL*Net is installed. If not, select it and change the value in the bottom boxes, then click `Set`.

6. Verify that a `FEMISTOPDIR=something` (where FEMIS was installed) environment variable exists in the System Environment Variables box. If not, create it the same way described above.

   Note: If you change anything, you must log out of NT and log back in.

7. Click `OK` to exit the System Configuration in the Control Panel.

3.3.2.8 Verify Clock Settings and Time Zone Settings

To set the date format preferences so that FEMIS can process the date correctly:

1. From the Program Manager, select `Control Panel`.

2. Select the `International` option.

3. Set your date format order to MDY (Month Day Year).

4. Verify that you are either using a 24-hour clock or that you have the labels for a 12-hour clock set to AM and PM (not case sensitive).

5. If time zone was not correct, from Control Panel, select the `Date/Time` option. Select the correct time zone and click `OK`.

3.3.2.9 Finish

The following are the final steps for the FEMIS installation:

1. If this is an upgrade installation, you may wish to clean up any old icons from the Program Manager. These may include old icons for the FEMIS program and old icons for running the startup batch files in the Startup group.

2. Log out of Windows NT.

   Note: If you saw a message about environment variables being added or added system environment variables by hand, you will need to log out of Windows NT and log back in so the changes to the environment variables take effect correctly.

3. Log into Windows NT as the appropriate user account. Run `FEMIS`.

4. **For the first PC: The installation of the first PC should be thoroughly verified (see Section 3.4, Validating the FEMIS PC Installation) before any more PC installations are started. If you must edit any of the configured files (`ODBC.INI`, `TNSNAMES.ORA`,), copy the corrected file back to the server and install again to be sure that it will work correctly.**

3.3.2.10 Setting a Met Simulator PC

If a PC is only going to be a Met simulator and will not run other FEMIS programs, you only need to perform the following parts of the above steps:

- Preparation (if this is a Windows NT machine).
- Connect Network Drive.
- Run the Setup program and Select the `Met Simulator` option.
- Verify clock and time zone settings.
- Finish.

If this PC will be both a normal FEMIS PC and a Met simulator, just run the setup program twice, once for `Full` or `Upgrade` to install FEMIS and a second time to install the Met simulator files.

3.3.2.11 Setting a Met Server PC

If a PC is only going to be a Met server and will not run other FEMIS programs, you only need to perform the following parts of the above steps:

1. Preparation.
2. Connect Network Drive.

3. Run the Setup program and Select the Met `Server` option.

4. Startup Group in Program Manager.

5. Verify clock and time zone settings.

6. Finish.

If this PC will be both a normal FEMIS PC and a Met server, just run the setup program twice, once for `Full` or `Upgrade` to install FEMIS and a second time to install the Met server files.

3.3.3 Updating all PCs at an EOC with New Files

In case there is a need to update all the PCs with a new file (such as a new `ODBC.INI` file or new GIS data files) all FEMIS PCs are configured to execute a batch file automatically if it exists in a specific directory on the server. This batch file can copy files as needed to update the PC.

The `NETFEMIS.BAT` file which connects to the `L:` and `M:` network drives when a user logs into Windows will execute a file named `M:\FUPDATE.BAT` if such a file exists. This will allow the System Administrator to update all PCs by editing a batch file and then just logging into each PC.

Note: This `M:\FUPDATE.BAT` file should only be editable by an administrator.

A template called `FUPDATE.TPL` file will be in the `I:\CONFIGD\` directories. It uses the following structure to run an update only once per machine. Only running an update once is especially important if the update is copying large GIS data files which can take a long time to copy.

```
::**Do patch #1 if hasn't been done already.
set patchxx=%femistopdir%patches\patch01.txt
if exist %patchxx% goto SKIP_PATCH01
    Echo * * * MSG: Doing Patch 01
    Copy m:\xxxx  %windir%\xxxx
    Echo "Did Patch" > %patchxx%
:SKIP_PATCH01
```

This method will allow you to edit the `FUPDATE.BAT` file so it can contain many patches and will only run those that need to be run on a PC.

3.4 Validating the FEMIS PC Installation

To run correctly, FEMIS software relies on many integrated components: the FEMIS database, commercial and government supplied software products, the FEMIS application, and

system support services. Therefore, it is important to ensure that the FEMIS system is fully operational. This section will assist the System Administrator to validate that the FEMIS system has been properly installed and is operating correctly.

The FEMIS Validation Checklist includes items that need to be checked to ensure that the FEMIS system is operating properly. These items are tested from the PC to ensure access and integration into the FEMIS application. This checklist provides a method to validate that the server and external communications are properly installed. If problems are encountered during the validation, refer to Section 17, Troubleshooting, for suggestions and guidance.

☐ **Verify the PC Configuration**

Verify the PC clock is using either a 24-hour clock or a 12-hour clock set to AM and PM. From the Windows Control Panel (should be in the Main program group), click on the `International` icon to verify your date format order is MDY (Month, Day, Year). Make sure you are using either a 24-hour clock or have set the labels for a 12-hour clock to AM and PM (not case sensitive).

☐ **Verify Network Time Protocol (NTP) Service**

To verify the Network Time Protocol has synchronized with the server:

- Login to the UNIX server and run `date` in a loop.
- Start the PC clock from the Windows Accessories group
- Stop the Network Time Protocol service from the Windows Control Panel.
- Change the PC clock to be slightly different (3 or 4 minutes) from the UNIX server clock.
- Start the Network Time Protocol service.
- Wait approximately 10 minutes for the PC clock to synchronize with the UNIX server clock.
- Check the Application log in Event Viewer for Network Time Protocol entries.

☐ **Verify Link to `M:` Drive**

Open the File Manger in the Main program group and verify that drive `M:` is displayed along with your other drives.

☐ **Verify Link to `L:` Drive**

Open the File Manger in the Main program group and verify that drive `L:` is displayed along with your other drives.

☐ **Verify Login**

Validate the ability to access the FEMIS application by double clicking on the `FEMIS` icon. Enter a valid the usercode and password. The FEMIS Tracking Navigator window should display.

☐ **Verify Database Connection**

After logging into FEMIS, select the `Operational` mode button. Access the `Current Info` item under the Help menu. You should see the types of information associated with your operational information. Click on the `Site and EOC Data` tab to see how you are interfacing with the FEMIS system. The Tracking Navigator (Operational) window should display site and EOC data. Selecting different EOCs from the EOC drop-down list should change the values and colors of the Tracking Navigator window, validating that FEMIS is connected to your EOC's database and is receiving replicated information from other EOCs.

☐ **Verify Database Manager**

Select `Utility` from the FEMIS Menu Bar, and then select `Data Manager` to validate the access to the FEMIS Data Administration functionality.

☐ **Verify Facility Manager**

Select `Data` from the FEMIS Menu Bar and then select `Facility` to validate the access to the FEMIS Facility Management functionality. Verify that you can view, add, or delete entries.

☐ **Verify Resource Manager**

Select `Data` from the FEMIS Menu Bar and then select `Resource Assignment` to validate the access to the FEMIS Resource Management functionality. Verify that you can view, add, or delete entries.

☐ **Verify Notification Server**

Leave the Tracking Navigator (Operational) window active during the testing of other FEMIS functionality. Edit all possible information on the Tracking Navigator to verify that notification is working. As the functions are completed, you should get a blinking icon which looks like a package on the Tracking Navigator. This is the notification server passing messages to your PC that FEMIS data notifications are being sent.

☐ **Verify D2PC**

The easiest way to check D2PC is to click on the `D2PC` button on the FEMIS Tracking Navigator (Operational) window. Be patient while the initial connection is made to the D2PC application and the FEMIS database. D2PC should come up with a default case and be ready to run. From the `Run` menu , select the `Run Model` item. You should quickly get a user interface window containing the results of the D2PC run.

Click the `Edit` option. Verify the `Log Runs` checkbox is checked. Rerun the D2PC case. Go to the `M:` drive under `User` to verify the D2PC case has been logged.

☐ **Verify GIS**

The easiest way to check that the FEMIS GIS is installed properly is to click on the `MAP` icon from the FEMIS Toolbar. The ArcView application should be initiated and you should see a base map displayed within an ArcView window.

To check the link between FEMIS and the GIS, select the `Regenerate Map Layers` option under the `Utility` menu. When FEMIS is initially installed, there may not be any Resource Assignments. Therefore, a message will display that the location cannot be found. Verify that there is resource data.

☐ **Verify Evacuation**

The easiest way to check that Evacuation works is to import and run an Evacuation case. Evacuation cases are located on the `home/femis/data/eva` directory. See the FEMIS Online Help for guidance on importing and running a case.

☐ **Verify Electronic Planning (Planning Mode)**

To run FEMIS Electronic Planning in the Planning Mode, you must have Microsoft Project loaded on your PC and a FEMIS Access Database properly "attached." The easiest way to validate this is to go click on Planning Mode from the FEMIS Tracking Navigator (Planning) window and select a dataset. Examine the Tracking Navigator window to be sure a Plan has been selected. Click on the `Edit` under Tasks, which is next to the Plan, on the FEMIS Tracking Navigator window. Microsoft Project will open and display the selected Plan. If you can do this without any errors or error messages, the FEMIS Planning software should work properly.

To ensure that the Pick List is properly attached, go to the Microsoft Project window. Select the ESF (Emergency Support Function) attribute cell and click the miner's pick icon on the Toolbar. The Pick List should come up. Click the `Fill List` button, and note the ESFs appear on the Pick List. Double click an item, and it appears in the plan.

Check that the GIS is properly linked to the plan by selecting either the location or location type cell in the Microsoft Project. Click the miner's pick icon on the Toolbar. The Pick List should come up. Click the `Fill List` button, and `Select Location` window, similar to the one in D2PC, should appear. Select a type, subtype, and name of the location from the drop-down lists. Click `OK` and then click the `Set MSP Value` button to get the location entered into the plan.

From Microsoft Project, test the resource interface by clicking the resource icon (two faces on the Toolbar). The resource assignment form should appear.

The Microsoft Project calendar should be set to a 24-hour clock and a 7-day calendar. Verify by clicking on `File` and then `Summary Info.` The Calendar field should display `Standard` which is equivalent to a 24-hour clock and a 7-day calendar.

☐ **Verify Help**

Use the Help icon (a lifesaver ring) on the D2PC Toolbar or any other FEMIS window to check that the Help subsystem is active.

☐ **Verify System Administration**

Select `Utility` from the FEMIS Menu Bar and then select `System Admin` to validate the access to system administration functionality.

☐ **Verify Meteorological (Met) Data**

Select the `Status` icon on the FEMIS Toolbar and then select `Met Conditions`. A window containing the most current meteorological (Met) data should appear on the window, if available.

☐ **Verify EMIS/FEMIS Data Exchange Interface**

Note: The definitive description of this interface can be found in Section 8.0, FEMIS Data Exchange Interface (DEI).

Click the `Status` icon in Operational mode and the select `Met Condition`. If the current meteorological (Met) data appears in the table, then the DEI is probably running.

☐ **Verify Site Defined Status Boards**

Select the `Status` icon on the FEMIS Toolbar, and then select `Site Defined`. The `Select Status Board` window should come up which allows the user to identify the Site Defined Status Board they wish to access.

To generate the layout for a Site Defined Status Board select the `Status Board Designer` item from the FEMIS `Utility` menu.

☐ **Verify Tracking Navigator**

To ensure that the user can change the Tracking Navigator, select the `Preferences` item from the FEMIS `File` menu. Select the `Use Matrix Navigator` option. This should reset the Tracking Navigator to the Matrix Navigator window. Then change the preference back to the Tracking Navigator.

☐ **Verify Printer**

Select the `Printer` icon from the FEMIS Toolbar and then select `Current Screen, Current FEMIS Window, Current FEMIS Child Window, or Selected Area`. This step should provide a printout of the item selected to the default printer.

A check of the GIS printouts is needed. From the GIS, print a map and verify that the printout is readable.

☐ **Verify E-Mail**

Select the `MAIL` icon from the FEMIS Toolbar. This should bring up the GroupWise E-mail software. Verify that you can send a mail message to another PC.

☐ **Verify COTS GIS Software**

Select the GIS item from the `Utility` menu. This should bring up the ArcView GIS software.

☐ **Verify COTS Mail Software**

Select the Mail item from the `Utility` menu. This should bring up the GroupWise electronic mail software.

☐ **Verify COTS Project Management Software**

Select the Project Management item from the `Utility` menu. This should bring up the Microsoft Project software.

☐ **Verify COTS Spreadsheet Software**

Select the `Spreadsheet` item from the `Utility` menu. This should bring up the Excel spreadsheet software.

☐ **Verify COTS Word Processor software**

Select the Word Processor item from the `Utility` menu. This should bring up the WordPerfect word processing software.

4.0 FEMIS Monitoring Tools

This section describes how to detect system errors by using the UNIX FEMIS Monitor. Also discussed in this section are tools that run on the PC. These tools include the PC Monitoring tool that checks database replication status; the Notification Watcher, which graphically shows the results of the UNIX FEMIS Monitor; and the WS_WATCH utility that graphically shows the network status.

4.1 UNIX FEMIS Monitor

The UNIX FEMIS Monitor provides the status of the FEMIS servers and databases. This UNIX FEMIS monitoring subsystem is secure and will not allow outside access to the FEMIS network via the monitoring subsystem. Significant effort was made to ensure that only a privileged FEMIS System Administrator could start, halt, or otherwise alter the execution of the FEMIS support applications.

4.1.1 Background

Due to network problems and unpredicted events such as power failures resulting in server shutdowns, critical functions including the Oracle databases may cease to operate. Distributed processing in FEMIS relies on all EOC servers working properly and on the network interconnecting them to be reliable. As a result, the system should be monitored regularly to detect any abnormal conditions. The UNIX FEMIS Monitor, developed to check the status of critical server functions, will detect most problems.

4.1.2 How to Detect System Problems

In the morning and at least several other times during the day, the System Administrator should observe the UNIX FEMIS Monitor output on the server monitor. If the monitor is not running, then start it by logging in as `femis` and typing `femismon.sh`. The monitor periodically (default is every minute) checks the status of major system interfaces, including the database, on each server. An example of typical output generated by the monitor under normal operating conditions is shown below.

```
* * * MSG: -- FEMIS Process Monitor --
* * * MSG: /home/femis/bin/femismon.sh
* * * MSG: Fri Apr  5 13:46:38 PST 1996
* * * MSG: ----------------------------
* * * MSG: -- FEMIS Processes Status --
```

```
* * * MSG: virus
* * * MSG:    femis_event   : up
* * * MSG:    # cmdserv     : 0
* * * MSG:    femisdei      : up
* * * MSG:    # Oracles     : 51
* * * MSG: ----------------------------
* * * MSG: -- Oracle Database Status --
* * * MSG: DB and Listener : ok   (tead on virus)
* * * MSG: Snapshot account: ok   (utst on virus)
* * * MSG: ----------------------------
* * * MSG: Sleeping...
```

The monitor first checks the status of your local server. If you use the `-all` command line option, all servers and databases are checked. In case a server was unavailable, a standard UNIX error message is displayed along with another warning message. These errors are due to complete network failure or server shutdown and should be uncommon. If a server failure is detected, try to determine the cause by contacting the System Administrator for the EOC. For example, if the server was down, the following messages would be displayed

```
* * * MSG: virus
* * * ERR: Server not responding: virus **********
```

If the server is available, the monitor then checks the femis_event process, which is the notification service. If the process is operating normally, the message: `femis_event :ok` is displayed; if problems are detected the message: `femis_event : down` is shown. Refer to Section 5.0, FEMIS Notification Service, for diagnosing and fixing notification problems.

The next check is on the number of FEMIS Command Service daemons running. The result is informational, and `0` is valid, which means no one is using the Evacuation module in FEMIS.

The monitor then checks on the `femisdei` (the FEMIS/EMIS Data Exchange Interface). The normal condition shows `femisdei : ok` but errors will display `femisdei : down`. This check is only performed on the server that supports the FEMIS DEI interface. Refer to Section 8.0, FEMIS/EMIS Data Exchange Interface (DEI), for diagnosing and fixing problems with this interface.

Next the number of current Oracle client processes is shown. If this number is over 100, serious problems have caused database sessions to abort.

The monitor's last check is on the Oracle database. The first step is to see if Oracle is running. The other items to check are the status of the local and any remote accounts for other EOCs. Normally, no errors will be present and a listing similar to the previous example will be displayed.

After the last check has been completed, notification messages are sent via the FEV utility, which the PC Monitoring tool uses. These messages indicate whether each item checked was running properly.

If any database errors are detected, the process will attempt to identify the probable cause according to the following precedence:

1. If the local Oracle Listener process has failed on a server, the following message will be displayed:

```
* * * ERR: DB or Listener : down (tead on virus) **********
* * * ERR:                  Oracle Listener on virus down
```

2. If the local Oracle database instance has failed, the following message will be displayed:

```
* * * ERR: DB or Listener : down (tead on virus) **********
* * * ERR:                  Oracle Database on virus down
```

3. If the network is unavailable or any other types of errors are present, the following message will be displayed:

```
* * * ERR: DB or Listener : down (tead on virus) **********
* * * ERR:                  Probable Network error
```

4. If Oracle replication errors are detected, the following message will be displayed:

```
* * * ERR: Snapshot account : down (utst on virus) **********
```

When database errors are reported, contact your Database Administrator. For more information, refer to the temporary files, `femismon.*.`, that are left in the `/tmp` directory. These files are especially useful for determining why replication is not working.

For site-wide monitoring, you can run the FEMIS Monitor with the `-all` option, which shows the status of all severs and all Oracle accounts on all servers.

4.2 FEMISMON Watcher (FWATCH.EXE)

The FEMISMON Watcher (`FWATCH.EXE`) program is a PC program that watches for notifications sent by the UNIX `femismon` program. This program shows the status of all the databases, replication snapshots, and other information for each server. It is designed to graphically notify you of a problem. `femismon` and `femis_event` must be running on the server for `FWATCH.EXE` to provide valid results.

You will only be notified if errors occur. If everything is OK, you will not get notifications.

You can start or stop some of the server programs from your PC using `FWATCH`. If you click the right mouse button for either a DEI (`femisdei`) or FEV (`femis_event`) cell, you will be given a form to select whether to start or stop the program and the password required to execute the command.

If no password is needed, leave the password textbox blank. To change the password required for the command, edit the `cmdserv.conf` file on the server. See the Section 6.0, FEMIS Command Server, for instructions on how to edit this file.

It is recommended that you use a password for these functions, and only System Administrators should know these passwords.

4.2.1 Notification Status

Across the top of the spreadsheet all the servers for the site are listed. Down the left of the spreadsheet are all the EOC databases for the site and rows for UNIX server status (SRV), `femisdei` (DEI) status, and `femis_event` (FEV) status.

As this program gets notifications, it fills in cells on the spreadsheet.

If the item is running correctly, `OK` is displayed in the cell, and it is colored green.

If the item is not running correctly, the cell is colored either yellow or red (depending on the severity of the error) and contains the text which indicates the error:

`ERR:DB` - if the database is down
`ERR:SNP` - if the snapshots are broken
`ERR:DEI` - if femisdei is not running
`ERR:FEV` - if femis_event is not running
`ERR:SRV` - if the server may be down.

Clicking on a cell will indicate when the last message for that cell was received and how many minutes ago it was received.

4.2.2 Menu Options

The colors will fade to white as the time since a message was received increases to indicate that the information may be out of date. This feature can be turned on or off using the `Fade Colors` under `Options` menu.

As messages are received, the program can beep, flash the window, or give a message to the user. You can choose the notification methods under the `Notifications` menu. Also under the `Notifications` menu, you can choose to be notified about messages from all EOCs and servers or just your own EOC and server.

Note: It is highly recommended that you **do not** use the message option for replication errors because many messages may appear if there are replication problems from one server.

If you have indicated that you want to be notified by a flashing window, the window will flash until you click the `Stop Flashing` menu item under the `Options` menu.

The `Clear Spreadsheet` option under the `Options` menu allows you to blank out the current view.

The Show Messages menu under the Options menu will either show or hide a list box of all the actual messages received from the server.

All the selections for the menu items are stored on the PC in the FEMIS.INI file so they will be the same the next time you start the program.

4.3 PC Monitoring (FMONPC.EXE)

The PC Monitoring tool (FMONPC.EXE) checks the FEMIS database replication status and does not require any user privileges to run (does not ask for a user login).

4.3.1 Replication Status

The basic operation is to start the program, then click the Check All Replication button. The program then connects to all databases, writes a record into the (unused) Known_Point replicated table, and continues to check all the databases to see if the records from the others have been replicated.

A spreadsheet of the results is shown on the form.

- The headers across the top are From Database XXX.
- The headers down the left side are To Database XXX.
- The cells contains the text *YES* if the data has replicated from one database to the other.
- The cells contains the text no if the data has not appeared yet.
- If the program cannot connect to a database, Error is shown for the entire row for that database.
- The spreadsheet should be read Data from database (Column Header) has/has not replicated to database (Row Header).
- Any errors are listed in a scrollable list box at the bottom of the form.

Note: If any of the diagonal items are **no**, then the database **has not** replicated to itself.

After each check of all databases, the utility will pause for a number of seconds to reduce its network and server usage. (The number of seconds to pause may be set under the Options menu. The default is 10 seconds.)

This utility will stop checking

1. If all the databases have replicated and everything says *YES*

OR

2. If a number of minutes has passed since it started to check. (Under the `Options` menu, set the number of minutes to keep checking. The default is 10 minutes.)

The `Check Server Programs` button causes the program to log into each database and indicates if it is accessible from the PC or not. The results are shown in a similar spreadsheet.

4.3.2 Options Menu

The following describes menu options.

- `Show Replication Timing` (approximate) -- displays the approximate time it took for the data at one EOC to be replicated to another EOC, instead of putting `*YES*` in the spreadsheet. To enable this option, highlight it, and a check mark indicates it has been enabled.

- `Stop Checking Replication` -- sets the length of time to continue checking. Select either 5, 10, or 30 minutes.

- `Pause Between Checks` -- sets the pause length between checks. Select either 5, 10, 20, or 60 seconds.

- `Check Replication To` and `Check Replication From` -- bring up a list so you can select one row or one column to see if replication is working to or from a single EOC.

- `Clear Spreadsheet` -- clears all entries on the spreadsheet.

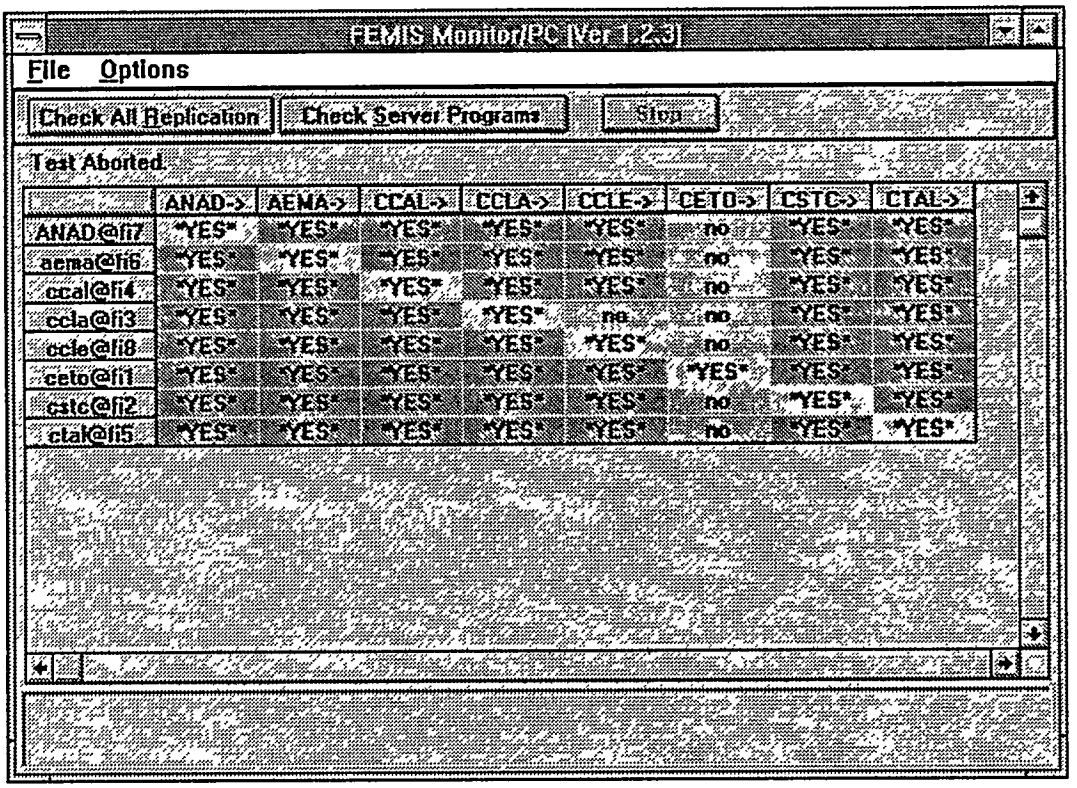
- `Cleanup All DBs` -- cleans up the information used by `FMONPC` in all databases in case there were network, server, database, or PC problems while `FMONPC` was running.

  Note: Using this option while another PC is running `FMONPC` can cause items in the spreadsheet to change, such as the whole spreadsheet will change to display `no`. If `no` appears from an EOC to itself when `YES` was previously displayed, then someone else probably used this option.

- `Clear Errors` -- clears the list box of errors at the bottom of the window.

Normally, the monitoring utility is installed only on the System Administrator's PC. It may be installed on a few selected PCs but should not be installed on every PC.

The following example illustrates that most of the database replication is working except that the CETO database has not replicated to any other databases (except itself) and the CCLE database has not replicated to the CCLA database.



4.4 Network Status Utility (WS_WATCH.EXE)

The WS_WATCH utility graphically shows the network status by coloring icons that indicate the status. This utility should be installed on one PC because it uses network resources when it is running. The PC will periodically send a message (ping) to a set of computers, servers, routers, or other network equipment to see if they respond. The graphical status indicates whether or not the network equipment responded to the ping from this single PC.

Note: The status may not mean that the entire network is up and working correctly, just that some route exists from this PC to the remote equipment. It does not indicate that other points on the network can connect to each other, or that the performance of the network may be unacceptably slow.

Note: To reduce the network resources used, **do not** change the time between checks to less than a minute. Longer durations (e.g., 5, 30, 60 minutes) between checks may be acceptable, depending on the reliability of your network.

Additional information on setting up and configuring the utility is available from WS_Watch Help.

This utility is freeware and distributed with FEMIS as a useful tool. Any comments or suggestions should be directed to the author of WS_WATCH.

5.0 FEMIS Notification Service

5.1 UNIX Host Notification Service

The COTS applications are developed by software companies that seldom, if ever, collaborate on the issue of data portability. Thus, when multiple COTS applications are brought together as in FEMIS, there is the question of how they should work together. The job of the FEMIS Application Manager is to ensure that all the FEMIS applications can work with one another without user intervention. The inter-task Notification Service is a process for dissimilar applications to communicate with one another during operation. Applications can post and receive event notifications within the FEMIS system with the support of the Notification Service residing on the UNIX host server and on client workstations.

Each workstation hosting the FEMIS client software uses the Notification Service to coordinate activities and data at three levels. The purpose of the Notification Service is to communicate status among active processes on a given workstation; between workstations on the same server; and among workstations on other servers. The Notification Service does not communicate data, but notifies active processes of the availability and location of relevant data in a timely fashion. It is the responsibility of the interested processes to retrieve the data. Likewise, processes which produce, manipulate, or transform data can notify affected processes of the new state of the data.

The Notification Service also resides on the UNIX host server. Its purpose is to receive and forward notification events to other servers. Workstations connected to this server may emit notification events destined for workstations connected to other servers. These events can be forwarded between servers where the local Notification Service can determine the final destination. The UNIX host server utilizes a relational database for the organization and storage of the enterprise data. The DBMS and any other server process can also use the Notification Service to coordinate activities.

Query, manipulation, and update of data are performed by applications residing in FEMIS workstations. These applications have the responsibility to notify other applications that require the same data of any data changes. This event is communicated via the Notification Service, which serves as the single point of contact that manages the distribution of the event to relevant receivers. When necessary, the Notification Service will propagate the event to distant workstations connected to other servers.

5.1.1 UNIX Notification Service

This section describes the Notification Service residing on the UNIX platform, which serves as the host server. The PC version of the Notification Service is included in the installation of the

FEMIS client software. Both versions have identical functions. The UNIX function that implements the Notification Service is called `femis_event`. The function of `femis_event` is to provide PC users of the FEMIS event notification system a communication path for the sharing of event information with each other. Events posted at one PC are sent to other PCs on the network by communicating with one or more notification servers.

Local events posted at one PC client workstation are received at the notification server running on LAN, and then sent out to all clients that have expressed an interest in that event.

Global events posted at one PC client workstation are received at the notification server running on LAN, and then sent out to clients on that LAN and also to other notification servers on wide area network (WAN).

The `femis_event` is normally run as a background daemon process. Scripts that are used to startup the FEMIS system also invoke the notification server.

As do all sockets servers, `femis_event` utilizes a predefined service port on which to listen for client connection requests. By default, the service port is obtained from a definition in `/etc/services`, the standard UNIX data file of Internet services and aliases. The standard service name of the notification server is `femis-notify`. The possible port numbers for the notification server, in FEMIS Version 1.3, are `9020-9029`.

5.1.1.1 Executable Binary Files

Two executable binary files are in the UNIX notification subsystem:

```
/home/femis/bin/femis_event : notification server executable
/home/femis/bin/fev : a test client for UNIX environment
```

5.1.1.2 Service Ports Data File

For the notification server to utilize its default service ports, they must be defined in the standard UNIX service ports data file, /etc/services. The following lines define the four new service ports (command, notification, and meteorological [Met] data servers) needed to operate FEMIS:

```
femis-command 9015/tcp     fxcommand # femis command server
femis-notify  9020-29/tcp fxnotify  # femis notification server
femis-metdata 9037/tcp     fxcommd   # femis met server
femis-monitor 9040/tcp     fxmonitor # secure femis monitor
```

These four service ports must be unique on the host being configured. If for any reason, one or more of the three service port numbers are already in use, contact Pacific Northwest National Laboratory immediately and configure the host using different service port numbers.

5.1.1.3 Daemon Server Startup

Scripts should be used to start or restart the notification server daemon. The following script will successfully start and restart the command and notification servers:

```
# sh /etc/init.d/femis {start or stop}
```

5.1.2 Notification Server Configuration Options

5.1.2.1 Command Line Options

The command line options of program femis_event that are defined in this section are

```
femis_event              : executes in foreground
femis_event -c           : executes a clone in background
femis_event -v           : report the current version
femis_event -V           : report the current + rcs versions
femis_event -q           : quiet mode
femis_event -Q           : really quiet mode
femis_event -d           : executes with many diagnostics
femis_event -q -d        : executes with only a few diagnostics
femis_event -L FFFF      : write a verbose log file named FFFF
femis_event -l FFFF      : write a brief log file named FFFF
femis_event -e FFFF      : write an error only log file
femis_event -s SSSS      : specifies service name for getservbyname
femis_event -S           : uses service name femis-notify if found
femis_event -p PPPP      : gets port number from environment
                           variable PPPf
femis_event -t secs      : RESERVED - NOT IMPLEMENTED (see note)
femis_event -i           : report primary ip address and port number
femis_event nnnn         : use port nnnn instead of standard
femis_event host         : connect to named server
femis_event host host    : connect to named servers (see note)
femis_event -r hostfile : gets hosts list from file (see note)
femis_event # host host : port number # and a list of hosts
```

Normally, only `femis_event -c host` will be needed to start executing a notification server. However, the additional options can be mixed to provide logging, diagnostics, and nonstandard service port usage.

5.1.2.2 Clone Process in Background Option

When this option has been included anywhere on the command line, the `femis_event` program clones itself and then the parent exits, leaving the child process to carry on as a background daemon process.

```
    if (fork () != 0)
    exit (0);
....
```

Example:

```
    femis_event -c
```

5.1.2.3 Display Version Options

Including `-v` or `-V` anywhere on the command line with `femis_event`, causes the current version or the current version with RCS version to be displayed. Example:

```
%. femis_event -v
FEMIS_EVENT - Version 1.0.11 - Wed Dec 14 15:19:49 PST 1994
% femis_event -V
FEMIS_EVENT - Version 1.0.11 - Wed Dec 14 15:19:49 PST 1994
  Copyright © 1994 Battelle Memorial Institute. All Rights
  Reserved.
RCS: $Id: femis_event.cc,v 1.2 1994/12/14 23:17:08 d31033 Exp
d31033$
```

The `femis_event` version is the current code version, not the FEMIS nor the RCS version. The date and time indicate when the executable was compiled and linked.

5.1.2.4 Diagnostic and Quiet Modes

Using `-d` causes diagnostics to be printed out when running in foreground mode, i.e., not using option `-c`. Including `-q` or `-Q` with `-d` limits the amount of diagnostic information printed out. Options `-q` and `-Q` mean quiet and real quiet respectively. Using `-d` alone produces verbose diagnostics. Using `-d -q` limits the diagnostics. Using `-d -Q` limits all but severe diagnostics. Examples:

```
% femis_event -q : quiet mode
% femis_event -Q : really quiet mode
% femis_event -d : executes with many diagnostics
% femis_event -q -d : executes with only a few diagnostics
```

5.1.2.5 Service Port Name Option

Including this option lets you specify the service port name on the command line rather than using the default name, `femis-notify`. Example:

```
% femis_event -c -s evtserv-test-3-eoc
```

For this command to work correctly, the service name `evtserv-test-3-eoc` must have been entered in the `/etc/services` data file.

Using option `-s` causes the standard service port name to be invoked.

5.1.2.6 Service Port Environment Option

This option lets you specify service ports in environment variables. Example:

```
% setenv MY_FEV_PORT 9027
% femis_event -p MY_FEV_PORT -c
```

5.1.2.7 Display IP Address and Service Port

When the notification server is started with the `-i` option, rather than starting up a Notification Service, it just reports status information about network addresses and exits. Information displayed includes the date/time of the last build (version identification), name of the local host, primary IP address of the local host, and service port number for the client connections. Example:

```
> su - femis
Password: ********
> femis_event -i
Last build ....... Thu Oct 17 11:54:08 PDT 1996
Host name is ..... fallout.pnl.gov
IP address is .... 130.20.92.118
Port number is ... 9020
>
```

The purpose of this directive is to obtain information needed in the multiple IP address workaround. Also see Section 2.2.6, Setting Up femis_event.

5.1.2.8 Enable Log Files

These options let you enable log file output from `femis_event`. The -e option creates an errors-only log file. Option `-l` produces a brief diagnostic log file. Option `-L` generates a verbose log. Place the desired file name in the argument following `-e, -l`, or `-L`. Examples:

```
% femis_event -e errors-only.log.12-24-94 -c
% femis_event -L femis_event.log.12-25-94 -c -p XMAS_PORT
% femis_event -l /home/femis/log/femis_event.log`date +%y%m%d.%H%M`
```

5.1.2.9 Nonstandard Port from Command Line

The notification server can be started with a nonstandard service port without the need for changes in `/etc/services` (which requires root access) or changing the environment variables simply by including the desired port number on the command line (specify only once). Example:

```
% femis_event -c 9920
% fev - 9920
```

5.1.2.10 Connecting to Other EOC's Notification Server

To have the notification servers at multiple EOCs connected together, include the names of the other EOC server hosts on the command line. Example:

```
server1:% femis_event -c server2
server2:% femis_event -c server1
```

5.1.2.11 Getting Remote Hosts from File

Rather than including the names of the remote EOC hosts on the command line, edit the names into a file and use the -r option.

5.1.2.12 Multiple Remote EOC Servers Limitation

At the time of FEMIS v1.3 release, no special server-to-server algorithms for routing had been implemented in the notification server. Smart routing algorithms may be implemented in a future version. Also, the `-t` option, a part of multi-host, is not implemented.

If you specify only one remote host, you get the optimal routing, which is host-to-host with no alternate conditions or routes.

If you specify two or more remote hosts, the local server connects with all the remote hosts you named. Global event messages are then relayed to all specified remote hosts, even though that may not be necessary. As a result, global messages may be sent to a remote host more than once.

5.1.2.13 Server To Server Connection

The FEMIS UNIX notification server (`femis_event`) supports a network of multiple notification servers. Any number of server programs can interconnect with each other, and the purpose of this interconnection is to provide a media for communicating global event messages, provided that topology of the network is not a concern.

To establish connection to other servers, a list of notification servers can be included on the command line. The syntax to designate a notification server connection is as follows:

```
host name (uses default service port)
```

In the following lines, all servers use the same default service port number. Example:

```
%femis_event -c countyeoc stateeoc
%femis_event -c irzcountyeoc pazcountyeoc stateeoc
```

Multiple notification servers can be executed on the same host by using a different service port number for each instance. The syntax to designate multiple notification server connections is as follows:

```
%port number>@<host name>
```

In the following lines, two notification servers are started and each is cross connected to the other. Example:

```
%thiseoc:/home/femis/exe/% femis_event -c 9021 9022@thiseoc
%thiseoc:/home/femis/exe/% femis_event -c 9022 9021@thiseoc
```

In the above example, service ports `9021` and `9022` are used rather than the default service port `9020`. Server `9021` is connected to server 9022, and server `9022` is connected to server `9021`. These connections are on the same host.

In the current FEMIS release, both concepts above have limitations. First, event routing is not optimized for more than two notification servers. Thus, a single event declaration will be sent multiple times on inter-network links.

A network of notification servers can be started by implementing exact topology in a series of startup commands. Example:

```
posteoc% femis_event -c 9020 9020@countyeoc 9020@stateeoc
countyeoc% femis_event -c 9020 9020@posteoc 9020@stateeoc
stateeoc% femis_event -c 9020 9020@posteoc 9020@countyeoc
```

The above example starts notification servers on three hosts: `posteoc, countyeoc`, and `stateeoc`. Each is capable of sending global event messages to the other two. No regard is

given to topology, i.e., each server sends events to the other two servers, even if having one of the others do a relay would accommodate more efficient use of network bandwidth.

An alternate way to start the servers is to start one, then add one to the network, and later add the third. Example:

```
posteoc% femis_event -c 9020
```

The above established a single notification server. Next enter:

```
countyeoc% femis_event -c 9020 9020@posteoc
```

We now have a two-node event server network: `countyeoc` connects to `posteoc`, which learns of the new server-to-server connection. We now have a two-node event server network. Next enter:

```
stateeoc% femis_event -c 9020 9020@posteoc 9020@countyeoc
```

We now have a three-node event server network. `Stateeoc` connects to both `posteoc` and `countyeoc` and each learn of the new server node.

Graceful removal of nodes from the notification server topology and optimization of topology for saving network bandwidth have not yet been implemented. These will be done in future FEMIS releases.

5.1.2.14 Which Service Port to Use

Which service port the notification server uses is determined as follows: from the following list, the first service port that produces a valid service port number is used as the service port method for this daemon server.

- If the port number is included on the command line, then that port is used even if the methods below also produce a valid service port number. Example:

  ```
  femis_event 9975
  ```

- If a service name is included on the command line (via `-s` or `-S`), then that service name is used in a `getservbyname()` call. If that service name returns a valid service port from the `/etc/services` data file, then that port is used. Example:

  ```
  femis_event -s FEMIS_ShellServer
  ```

- If an environment name is included on the command line, then that environment name is translated into a service port number. Example:

  ```
  setenv MYPORT 7120 ; femis_event -p MYPORT
  ```

- The default service name, `femis-notify`, is tried in a call to `getservbyname()`. If that returns a valid service port, then that port number is used.

- The default environment name `FEMIS_EVENT_PORT` is translated. If that name is defined and translates to a valid port number, then that service port is used.

- If all the above fail, `femis_event` terminates with an error.

Normally, you can just use the standard service port number from the `/etc/services` file. However, for testing and diagnostics, additional methods have been included for running additional notification server modules that use a nonstandard port number, so there is no interference with normal operations.

5.1.3 Notification Server Utilities

5.1.3.1 UNIX Test Client - fev

The notification server subsystem includes a test client for the UNIX system environment. The UNIX client can be used to test features of the command server, both new and old, and to perform certain diagnostics.

Note: This client is not an integral FEMIS system component.

The file name of the test client is `fev`. The UNIX test client is installed at the same subdirectory as the notification server (see Section 5.1.1.1, Executable Binary Files).

5.1.3.2 UNIX Test Client Command Line Options

Valid command line options for `fev` have the same format and usage as the notification server. Example:

```
% fev host nnnn # nonstandard port and host from command
% fev - nnnn # nonstandard port local host (testing only)
% fev -p PPPP # nonstandard port from environment variable
% fev -s SSSS # nonstandard port from /etc/services file
% fev -S # use standard service name femis-notify
% fev -I IDNUM # specify notification client id number
% fev -x # don't exit on eof from standard-input
```

See descriptions of these options in Section 5.1.2, Notification Server Configuration Options.

5.1.3.3 Client ID Number

You can simulate what happens when a notification system client crashes and then comes back online. In that case, the PC/client needs to receive the same client ID number that was assigned to that PC during the previous session. The notification server handles that scenario correctly, but during testing on a single development host, you need to tell the test client which client is connecting by specifying the client ID from the previous session (see o command reply).

```
Syntax: fev -I IDNUM
```

5.1.3.4 Test Client Protocol

To run the notification server test client, do the following:

```
% set path = (/home/femis/exe $path)
% fev # connect to local host, standard port
% fev <remote host> # connect to a remote host
% fev - <port> # connect to nonstandard port on this host
% fev <remote host> <port># connect to nonstandard port on
remote host
```

The notification server test client provides several shorthand commands to the actual notification server protocol, as follows:

```
o : sends open-link message (NS_MT_OPENLINK)
: reply message contains the client's link id
c : sends close-link message (NS_MT_CLOSELINK)
i EEEE : sends register-interest message (NS_MT_REGISTER_INTEREST)
r EEEE : sends remove-interest message (NS_MT_REMOVE_INTEREST)
e EEEE : sends declare-event message (NS_MT_EVENTMSG) (nonglobal)
g EEEE : sends declare-global message (NS_MT_EVENTMSG & NS_EF_GLOBAL)
t1 : bombard server with multiple NS_MT_EVENT testing
t2 : bombard server with multiple NS_MT_EVENT testing
```

5.1.3.5 Test Client Example

Example:

```
server1:% femis_event -c 9920 server2
FEMIS_EVENT port is 9020
server2:% femis_event -c 9920 server1
FEMIS_EVENT port is 9020
server3:$ fev server1 9920
FEMIS_EVENT port is 9020
o
<<<<<< received OPENLINK-reply: client-id = 2
i TestEvent
i GlobalEvent

server4:>%fev server1 9920
FEMIS_EVENT port is 9020
o
<<<<<< received OPENLINK-reply: ...
client-id = 3
e TestEvent

<<<<<< received notification: event=TestEvent

c
^D
server4:% fev server2 9920
o
<<<<<< received OPEN-LINK-reply: ...
client-id = 2
```

```
e TestEvent
g GlobalEvent

<<<<<< received notification: event=GlobalEvent

c
^D
c
^D
```

In the example, the operator runs the notification server on two hosts, `server1` and `server2`; they connect to and communicate with each other because the other's host name is on the command line.

Next, the client is run on `server3`, connecting to `server1`, a link is opened, and interest is declared in two events, TestEvent and GlobalEvent. Also, the client is run on server4, connecting to `server1`, a link is opened, and event `TestEvent` is declared. Because the client on `server3` has declared interest, a notification message is delivered and reported there.

The client on `server4` is next terminated (via close link and `control-D`). The `server4` client is rerun, this time connecting to `server2`, and the link is opened. The event `TestEvent` is then declared at `server2`. Nothing happens at `server3`, as it is global (not local) to the server on `server2`.

Finally, the client on `server4` declares a global event (`GlobalEvent`), and the client on `server3` is notified. The path is `server4` to `server2`, `server2` to `server1`, and finally `server1` to `server3`.

Both test clients are then terminated via close link and `Control-D`.

5.1.3.6 Test Client Diagnostics

The test client `fev` has features whereby it can spy on what notification servers are doing and what the status of each connection is. The two commands are

```
$I : sends back information and statistics
$s : sends back socket connections information
```

5.1.3.7 Test Client Information Diagnostic $I

Entering `$I` at the `fev` test client's terminal causes statistics information to be returned to the client. Example:

```
% fev server1
FEMIS_EVENT port is 9020
$I
FEMIS_EVENT - Version 1.0.11 - Wed Dec 14 15:54:18 PST 1994
started time . . . . . Sat Dec 17 03:00:09 1994
current time . . . . . Mon Dec 19 13:51:59 1994
pid  . . . . . 23473
ppid . . . . . 1
uid  . . . . . 30508
```

```
gid  . . . . . . . . . . 30508
dir  . . . . . . . . . . /home/femis/exe
home . . . . . . . . . . /home/femis/sunos/home/femisuser
host . . . . . . . . . . server1
port . . . . . . . . . . 9020
background . . . . . . . Yes
accepts  . . . . . . . . 192
connects . . . . . . . . 1
reconnects . . . . . . . 0
messages rcvd  . . . . . 11826
characters rcvd  . . . . 513556
messages sent  . . . . . 1274
characters sent  . . . . 85600
malloc arena/used  . . . 61448 35416
evtbuf cur/tot/peak  . . 2 9 9
evtbrd cur/tot/peak  . . 2 9 2
intlist cur/tot/peak . . 288 2607 306
```

From the display above, you know the following information about the notification server daemon: has been up for 2 days, was started at 3:00 a.m. on Dec 17, is the Dec 14 version; the process ID is `23473`; the sever is in background (because `ppid == 1`); its uid is `30508` (femis account); user's home is `/home/femis/sunos/home/femisuser`; the host's name is server1; the service port number is `9020` (the standard port); the notification server is running as a clone in background; and the server currently has `35416` bytes of dynamic memory allocated.

Furthermore, the server has accepted `192` connections, has established one connection itself (to the other server), has done no reconnects (because of connection termination), has received `11826` messages containing a total of `513556` characters, and has transmitted `1274` messages containing a total of `85600` characters. Using either received or transmitted, the average message length is approximately 42 characters.

For event library statistics `evtbuf, evtbrd`, and `intlist`, also reported are current, total, and peak.

Character and message counts utilized in the diagnostic messages overhead are not included in the totals displayed.

5.1.3.8 Test Client Socket Connections Diagnostic $s

Entering `$s` at the `fev` test client's keyboard causes socket connection information to be sent to the test client's display. Example:

```
% fev server1
FEMIS_EVENT port is 9020
$s
```

The heading of the display which follows contains:

```
ii : index number in femis_event's internal database
lisn : 1 if socket is the server's primary listening socket
acpt : 1 if connection was accept()-ed on this socket
```

```
conn : 1 if connect() was established on this socket
stio : 1 if this is one of the standard i/o files
svrc : 1 if accept or connect is to another server
chan : the channel number
host : name of the host to which this socket is connected
IP : the IP address to which this socket is connected
hwid : 32 bit hardware id number - derived from IP address
anid : the notification system client id number
when : when (date and time) when connection was established
rcv : number of messages and number of characters received
xmt : number of messages and number of characters transmitted
```

Example display of first 11 parameters:

```
ii lisn acpt conn stio svrc chan : host : IP : hwid : anid :
3 1 0 0 0 0 3 : server1.pnl.gov : 130.20.76.45 : 82144C2D : 0 :
4 0 1 0 0 0 4 : server5.pnl.gov : 130.20.28.29 : 82141C1D : 19 :
5 0 1 0 0 1 5 : server2.pnl.gov : 130.20.242.31 : 8214F21F : 0 :
6 0 1 0 0 0 6 : 130.20.28.131 : 130.20.28.131 : 82141C83 : 71 :
7 0 1 0 0 0 7 : server6.pnl.gov : 130.20.60.103 : 82143C67 : 47 :
8 0 1 0 0 0 8 : server4.pnl.gov : 130.20.92.71 : 82145C47 : 69 :
9 0 1 0 0 0 9 : server3.pnl.gov : 130.20.92.87 : 82145C57 : 0 :
10 0 1 0 0 0 11 : server7.pnl.gov : 130.20.92.39 : 82145C27 : 53 :
```

Example display of final 5 parameters:

```
when : rcv : xmt
Sat Dec 17 03:00:12 1994 : r 0 0 : x 0 0
Mon Dec 19 09:50:29 1994 : r 255 11115 : x 7 473
Sat Dec 17 03:00:24 1994 : r 0 0 : x 4 319
Mon Dec 19 10:47:17 1994 : r 91 3896 : x 8 547
Mon Dec 19 10:27:49 1994 : r 259 11303 : x 8 547
Mon Dec 19 10:45:24 1994 : r 56 2335 : x 2 117
Mon Dec 19 11:14:17 1994 : r 13 13 : x 0 0
Mon Dec 19 10:29:36 1994 : r 56 2335 : x 2 117
```

From the above display, we can say that 5 clients currently have active connections, that client ID numbers range from 19 to 71, and that one client has no entry in the local name table (IP address `130.20.28.131`).

Socket 3 is the listening socket. Socket 5 connects to the notification server on `server2`. Socket 9 is the client doing diagnostics.

Character and message counts utilized in the diagnostic messages are not included in the totals displayed.

5.1.3.9 Test Client Auxiliary Connect Information Diagnostic $aux

Entering `$aux` at the `fev` test client keyboard causes the auxiliary connect information to be sent to the test client's display. Example:

```
% fev server1
FEMIS_EVENT port is 9020
$eve
```

The heading of the display which follows contains:

```
ii : index number in femis_event's internal database
conn : connect mode = L C A
svrc : server circuit = 0 1
auxtype : aux connection type S C U
host : name of host to which this socket is connected
hwid : 32 bit hardware id number - derived from IP address
port : port number of server/client at remote end
pid : process id number of server/client process at remote end
cid : client id number of server/client process at remote end
```

Example listing:

```
5 L 0 : U : virus.pnl.gov : 8214F20A : 9020 : 14415 : 0
6 C 1 : S : locusts.pnl.gov : 8214F20B : 9020 : 12093 : 0
7 A 0 : U :  : 0 : 0 : 0 : 46
8 C 1 : S : temblor.pnl.gov : 8214F20C : 9020 : 19831 : 0
9 A 0 : U :  : 0 : 0 : 0 : 38
10 A 0 : U :  : 0 : 0 : 0 : 48
11 A 0 : U :  : 0 : 0 : 0 : 43
12 A 0 : C : hattrick : 82145C57 : 9020 : 2593 : 0
```

5.1.3.10 Test Client Remote Servers Diagnostic $rem

Entering `$rem` at the `fev` test client keyboard causes the remote connect information to be sent to the test client's display. Example:

```
% fev server1
FEMIS_EVENT port is 9020
$rem
```

The heading of the display which follows contains:

```
RemoteServer : Port number @ host name of the remote
notification server
IPAddress : IP address of the remote host
Address : 32 bit hardware id number - derived from IP address
```

Example listing:

```
RemoteServer : IPaddress : Address
9022@virus.pnl.gov : 130.20.242.10 : 8214F20A
9021@temblor.pnl.gov : 130.20.242.12 : 8214F20C
```

5.1.3.11 Test Client Event Board Diagnostic $eve

Entering `$eve` at the `fev` test client keyboard causes the server's event board information to be sent to the test client's display. Example:

```
fev - test client for femis_event server
FEMIS_EVENT port is 9020
$eve
```

The heading of the display which follows contains:

```
EventName : name of the event
ExerID : exercise id
Par1 : first parameter
Par2 : second parameter
Par3 : third parameter
GMT : date/time event declared
RecID : record id
```

Example listing (abbreviated):

```
EventName : ExerID : Par1 : Par2 : Par3 : GMT : RecID
CSEPPEvent      : 0    : 10000299   :          : ALL_OVER  : 18:25 : 37
MD2             : 1295 : Operations :          : UPD:10001 : 18:38 : 41
PLN:PlanChanged : 0    : 10000107   :          :           : 18:17 : 33
PLN:TaskChanged : 0    : 10000006   : 21       :           : 16:17 : 23
RSB:EventLogAdd : 0    : J          : AckEvent :           : 18:25 : 39
RSB:EventLogAdd : 1295 : J          : D2:10001 :           : 18:37 : 40
UDept           : 0    :            :          :           : 15:19 : 19
UFacility       : 0    :            :          :           : 15:16 : 18
ULocalID        : 0    : TEADTEAD   : alstuff  :           : 15:48 : 43
UPerson         : 0    :            :          :           : 16:48 : 24
```

5.1.3.12 Test Client Synchronize Action $sync

Entering `$sync` and a qualifier at the `fev` test client keyboard causes the server to send the same message back to `fev`, which can utilize reception of known `dollar-sync` messages to synchronize certain events and actions.

The test client uses the command `$sync exit` to synchronize forced exit while running in script mode, which must be used in conjunction with the `-x` option.

Example script:

```
#!/bin/csh -f
#
fev -x virus 9020<<eod
o
g My-Event 1 "par one" par_two par3
g My-Event 123 "" - 999.000
g Your-Event 99 - - -
c
\$sync exit
eod
```

The above script runs `fev`, opens a link, declares the three events, closes the link, and synchronizes a forced exit.

5.2 PC Notification Service

5.2.1 PC Notification Service Overview

This section describes the PC Notification Service, which serves as the PC workstation component of the FEMIS Notification Service. The PC Notification Service is designed to provide a path for sharing notification information between PC applications, PC workstations, and UNIX notification servers. Events posted by applications within a PC workstation are first sent to all notification clients on that PC, then forwarded to a UNIX notification server for distribution to other workstations and other notification servers.

The PC Notification Service operates in the background and provides services to PC applications through function calls and window messages. There is no direct user interface except the Notification Service log window, which displays diagnostic messages as the service is running.

The PC Notification Service is implemented as a dynamic link library (DLL) rather than a stand-alone service. The Notification Service DLL is automatically activated when client applications are started and remains active until all clients have been closed. There are no separate startup or shutdown procedures. Instead, notification startup and operations are controlled through configuration files and client function calls, not through command line options.

5.2.1.1 Executable Binary Files

The PC Notification Service has one executable binary file:

`FNOTIF1.DLL` Notification Service function library

This file is normally located in the `WINNT\SYSTEM` directory but may be placed elsewhere, as long as it can be found on the system search path.

5.2.1.2 Notification Service Startup

Since the Notification Service is implemented as a dynamic link library, there is no user control over startup operations. Instead, startup parameters are read from a configuration file and can be adjusted to suit the needs of a particular installation.

5.2.2 PC Notification Service Configuration Options

The PC Notification Service can be customized by modifying one or more configuration parameters. These parameters allow you to change Notification Service behavior to accommodate client needs and special requirements. For instance, a remote user connected via a modem may need to increase the timeout limit for notification server connections, or a stand-alone installation might want to disable all network monitoring. Each of these requirements can be satisfied by adjusting the configuration parameters to fit the client's needs.

5.2.2.1 Configuration Parameters

Each configuration parameter has a unique name and most have a default value. For FEMIS v1.3, the available configuration parameters are as follows:

Parameter	Purpose	Default Value
RunAsStandAlone	StandAlone flag (True/False)	False
SocketMaxWait	Socket timeout value (seconds)	10
LostConnCheckInterval	Lost connection check (seconds)	30
LostConnRetryInterval	Lost connection retry (seconds)	30
EventQueueSweepInterval	Queue sweep interval (seconds)	1
DefaultNotifServerHost	Default server host name	none
DefaultNotifServerPort	Default server port	none

If the default value for a parameter is not satisfactory, you can assign a more suitable value. However, you must be careful that the new value is reasonable and does not have an adverse effect on Notification Service operation.

5.2.2.2 Notification Service Configuration File

Notification Service configuration parameters are specified in a configuration file, `FEMIS.INI`, usually located in the Windows NT home directory. Each configuration parameter is specified by a key and its associated value, grouped under the [Notification Service] section.

A typical `INI` file might look like this:

```
[Notification Service]
;----Notification configuration parameters----
;RunAsStandAlone = False
LostConnCheckInterval = 10
LostConnRetryInterval = 60
```

To create an entry for a configuration parameter, insert a new line that specifies the parameter's name and its new value, separated by an equals sign (=). Key names are not case sensitive and all blank padding is ignored.

To disable an entry, put a semicolon as the first non-blank character in the entry, which causes the line to be treated as a comment and ignored in all parameter processing.

5.2.2.3 Command Line Options

Since the PC Notification Service is not a stand-alone unit, there are no command line options.

5.2.2.4 Environment Variables

No environment variables are used by the PC Notification Service.

5.2.2.5 Host Server Name and Port

UNIX host server name and port number are set by client function calls and are not directly controlled by configuration options. However, clients can use the `DefaultNotifServerHost` and `DefaultNotifServerPort` configuration parameters to store server identification information.

Note: FEMIS v1.3 does not support concurrent connections to multiple notification servers--only one server can be connected at a time.

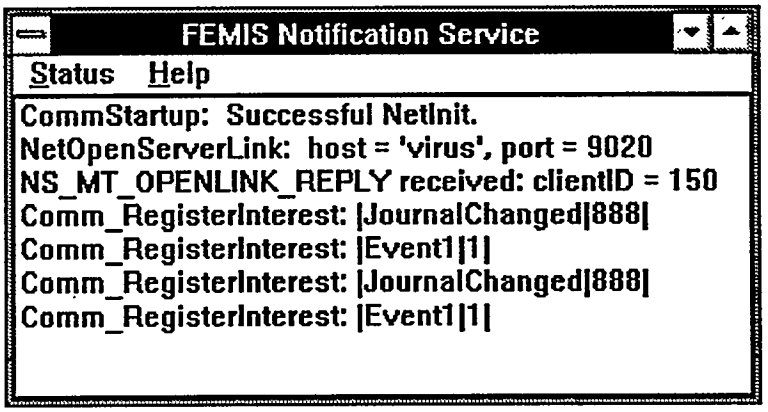
5.2.3 PC Notification Service Operation

Operation of the PC Notification Service is discussed in the following sections.

5.2.3.1 Notification Service Window

The Notification Service window enables a user or administrator to view information about notification system operations. This window provides information about the system status and current version, along with a log of recent diagnostic messages. When this window is minimized, its icon indicates the current Notification Service status:

Stand-alone	-	blue icon with red border
Connected to server	-	blue icon with black border
Lost connection	-	blue icon with red slash across it



For status information, select `System Status` under `Status` on the menu bar. This activates the `Status` window, which displays information about local and server status, client count, event count, server host name, and server port number. However, the `Status` window does not update itself automatically, so its information may be incorrect if the window is left open for any length of time.

For version information, select `About Me` under `Help` on the FEMIS Menu Bar. This activates the `About Me` window, which contains version and copyright information.

For diagnostic information, consult the main `Notification Service` window. This window displays recent diagnostic and error messages, including network messages to and from the server and attempts to restore lost server connections.

5.2.3.2 Lost Connections

Lost connections with the UNIX notification server are a common problem and occur for a variety of reasons. The PC Notification Service is designed to automatically detect and restore lost connections, with minimal impact on FEMIS software operations.

Whenever a lost server connection is detected, the PC Notification Service sends a diagnostic message to the log window, activates the Lost Connection icon, and goes into restoration mode. Every few seconds, as specified by the `LostConnRetryInterval` value, the Notification Service attempts to contact the server and restore the connection. During this time local notification still occurs but all messages to and from the server are lost and cannot be recovered. When the server finally answers, the connection is restored and the Notification Service returns to normal operation.

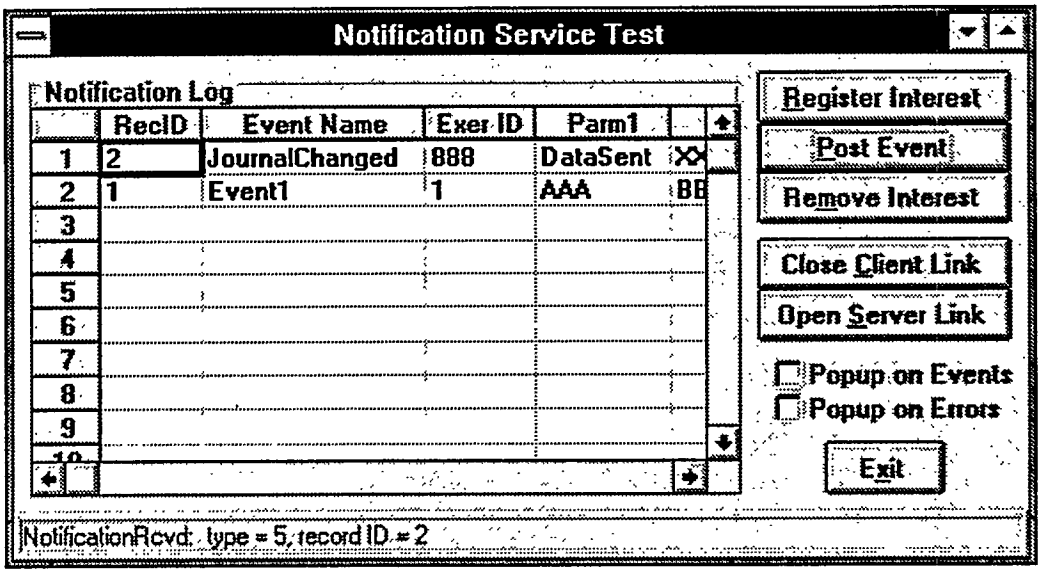
As discussed in Section 5.2.3.1, Notification Service Window, you can use the status icon or status window to monitor lost connections. However, the status window does not update itself automatically, so its information may be incorrect if the window is left open for any length of time.

5.2.4 PC Notification Test Client

5.2.4.1 PC Test Client - NOTITEST.EXE

The PC Notification Test Client, `NOTITEST.EXE`, is included in the FEMIS installation and can be used to test notification functions and diagnose notification problems. This program can enables a user to manually post notification events, monitor events generated by other applications, and force notification errors for testing purposes. See the Section 5.2.4.4, PC Test Client Functions, for more information.

At startup, `NOTITEST` automatically establishes a notification client link and registers an interest in the `Event() 1 : 1` event. It also enables notification loopback so it can receive its own events. However, `NOTITEST` starts in stand-alone mode, without connecting to a UNIX notification server. Use the `Open Server Link` function if you wish to open a link to your notification server.



5.2.4.2 PC Test Client Configuration

The PC Test Client has no configuration options or other means to customize its default behavior. However, the test functions (below) can be used to change client behavior at runtime.

5.2.4.3 PC Test Client Command Line Options

The PC Test Client has no command line options.

5.2.4.4 PC Test Client Functions

The PC Test Client offers a variety of functions for testing the Notification Service. These functions are accessible through command buttons on the test client user interface screen.

Open Client Link
The Open Client Link function opens a notification client link, allowing the test client to register interests and post notification events. This function is enabled only if there is not an existing client link.

Close Client Link
The Close Client Link function closes the existing client link to the Notification Service, disabling client notification, and discarding all interests registered by the client. This function is enabled only when there is an existing client link.

Open Server Link
The Open Server Link function opens a link between the PC Notification Service and a named notification server. The user is prompted for the server name and port number. When the user clicks the OK button, the Notification Service closes the previous server link (if any) and sends a connection request to the new notification server.

If the server is available, a connection is established and this server becomes the notification server for this PC. If the server is not available, the Notification Service will ask whether you wish to retry the connection. If you select Yes, the Notification Service will treat the problem as a lost connection and go into restoration mode. Otherwise, the Notification Service will go into stand-alone mode and operate without a server connection.

This function is enabled at all times and is useful for testing server connections and simulating lost connections.

Register Interest
The Register Interest function enables the test client to register an interest in one or more notification events. The user is prompted for an event name and exercise number that uniquely identify a notification event. When the user clicks the OK button, the test client registers an interest in the specified event and begins to log all notifications for that event.

This function is very useful for troubleshooting notification problems because it allows the user to monitor notification events posted by other applications. For instance, if an application is not responding to a specific sequence of notification events, the test client program can register an interest in those events and verify that the events are being sent in the correct order.

This function is enabled only when the test client has a valid client link.

Remove Interest
The Remove Interest function enables the test client to remove an interest in one or more notification events. The user is prompted for an event name and exercise number that uniquely identify a notification event. When the user clicks the OK button, the test client removes its interest in the specified event and is no longer notified about that event.

This function is enabled only when the test client has a valid client link.

Post Event
The Post Event enables the test client to post a notification event and simulate events posted by other applications. The user is prompted for the event name, exercise number, and three event parameters, along with control flags that determine how the event will be processed. When the user clicks the OK button, the test client sends this event to the Notification Service for distribution to other local and remote clients.

This function is very useful for troubleshooting notification problems because it allows a user to simulate notification events posted by other applications. For instance, the test client can post a specific sequence of notification events and verify that other applications respond correctly to that sequence.

This function is enabled at all times.

Popup On Event
The Popup On Event option is used to alert the user each time the test client receives an event notification. This allows the test client to function as an event monitor by displaying a popup message box whenever an event is received. This function can also test the Notification Service queuing functions by introducing a user-controlled delay into the event processing system.

Popup On Errors
The Popup On Errors option facilitates error-handling tests by displaying a popup message each time an invalid notification message is received.

5.2.4.5 PC Test Client Diagnostics

The PC Test Client does not include any diagnostic functions in FEMIS v1.3.

5.2.5 Notification Server Troubleshooting

The notification server is very stable; however, this program runs in a network environment and, thus, is prone to any and all failures which can occur in network computing and distributed data management systems.

5.2.5.1 Check Notification Server Active

To check if the notification server is active, log in to the UNIX server and issue the following command:

```
%/usr | ucb | ps axw | grep femis_event
```

If the notification server is active, you will get a reply such as:

```
17739 pe S 0:00 femis_event -c server1 -e
femis_event.e.log.941219.1140

1073 pe S 0:00 grep femis_event
```

If the notification server is not active, only the second line above will be displayed. The pid of the `femis_event` notification server is the first number shown, e.g., `17739`.

5.2.5.2 Check Notification Server Communication

To check the notification server communication, run the UNIX test client either from the server host or from another UNIX system. You should be able to run `fev` and issue notification server instructions. Example:

```
% fev
```

If the notification server is not active, you will get a reply such as the following and then be returned to the command line processor:

```
fev - test client for femis_event server
FEMIS_EVENT port is 9020
connect failed: Connection refused
%
```

If the notification server is active, you should get a reply such as the following:

```
fev - test client for femis_event server
FEMIS_EVENT port is 9020
```

After receiving the above reply, you can issue an instruction to the UNIX test client. Example:

```
o
```

This is the test client's command to open a link. Next you should see

```
<<<<<< received OPENLINK-reply: client-id = nnnn
```

where nnnn is an open link ID number (could be any positive integer). If you get such a reply, the notification server is active and communicating. If the notification server is active and communicating, then the problem is probably either in the network or on the PC side.

5.2.5.3 Aborting Notification Server

If you need to abort the notification server during testing or troubleshooting, you must manually log in as the user account from which `femis_event` was started. In FEMIS v1.3, that user account is femis, or you can log in as superuser.

You next need to learn the process ID number (pid) of the `femis_event` server needing to be killed. There are two ways to learn the pid of a FEMIS server process.

The first is to use the `ps` and `grep` commands. Example:

```
%/usr | ucb | ps axw | grep femis_event
```

If the notification server is active, you will get a reply such as:

```
23473 pe S 0:00 femis_event -c server2 -e
femis_event.e.log.941219.1140
1073 pe S 0:00 grep femis_event
```

If the notification server is not active, only the second line above will be displayed. The pid of the `femis_event` notification server is the first number shown, e.g., `23473.`

The second way to learn the pid of `femis_event` is to run the test client and use the `$I` spy command. Example:

```
% fev - # connect to local host
fev - test client for femis_event server
FEMIS_EVENT port is 9020
$I
pid . . . . . 23473
```

From the `$I` reply, the `femis_event` pid is `23473.`

Now that you have the pid number, you can abort the notification server. The preferred way is

```
% kill -2 23473
```

Recheck if the server is still active. If the above `kill -2` (the graceful exit), did not work, then use

```
% kill -9 23473
```

Using `kill -9` will kill the notification server, but the state of open connections will be lost and possibly may not be recoverable until some long TCP/IP timeout period elapses.

A script file, such as the following, may be used

```
foreach killnum ( -2 -9 )

ps ef >! ..PS..
set serverpid = ( `fgrep femis_event ..PS.. | awk `{print $2}' ` )

foreach pid ( $serverpid )
echo kill $killnum $pid
kill $killnum $pid
end

end
```

5.2.5.4 Fixing Notification Port

When running a FEMIS client application such as a Visual Basic application, the application first uses the `FEMIS.INI` file in the Windows directory to get the notification server's name and port number. If either the name or port number is incorrect, you will get an error 10054. You could fix the file to avoid this error occurring in the future; but it is not necessary because the Visual Basic application then lets you login to an EOC and gets a new notification server name and port number from the FEMIS database. If either the new name or port number is incorrect, you will get an error 10054. You must then correct the EOC table by changing the values for either the `EOC_SERVER_NAME` or the `EOC-NOTIFY_PORT` fields.

5.2.5.5 PC WinSock Errors

The following list includes the errors encountered during development and testing of the notification server software. A complete list of WinSock and UNIX errors can be found in *Windows Sockets, Version 1.1* documentation.

PC WinSock Error 10022
This error is an internal Windows Sockets error which is caused when a Windows application crashes/terminates without properly closing down. In doing so, the Windows application has wasted and lost critical dynamic memory. Error 10022, which means invalid argument, is reported by mistake. The real problem is Windows running out of a critical resource. Shut down other Windows applications and reboot the PC.

PC WinSock Error 10024
This error is an internal Windows Sockets error which is caused when a Windows application crashes/terminates without properly closing down. In doing so, the Windows application has wasted and lost critical dynamic memory. Error 10024, which means too many files open, is reported by mistake. The real problem is Windows running out of a critical resource. Shut down other Windows applications and reboot the PC.

PC WinSock Error 10038
This error is an internal Windows Sockets error which is caused by a software error, most likely manifested from Windows running out of a critical resource. In reaching this error, an application has tried to reuse an I/O channel which was previously connected to a network socket but has since been closed. Restart the affected applications. If this does not fix the problem, reboot the PC.

PC WinSock Error 10050
This error means the network is down; there is no network communication with the server host to which this PC is trying to connect with. Report the error to the System Administrator and wait for a diagnosis. After all hardware and communication bugs have been fixed, restart the affected applications. If this does not fix the problem, reboot the PC.

PC WinSock Error 10053
This error means that connection to the server was aborted and may be because the server was terminated, either intentionally or by a failure. This error can also mean that connection was never established because the server is not currently active. Check if the notification server, `femis_event` is currently active on the UNIX server. If not, restart it using scripts described in Section 5.1.1.3, Daemon Server Startup. The UNIX test client can be used to check for server health, see Section 5.1.3, Notification Server Utilities.

PC WinSock Error 10054
This error means that the notification server is not active. Check if the notification server, `femis_event` is currently active on the UNIX server. If not, restart it using scripts described in Section 5.1.1.3, Daemon Server Startup. The notification subsystem UNIX test client can be used to check on server health, see Section 5.1.3, Notification Server Utilities.

This error can also mean that the client software on the PC does not have the correct service port number or server. The default port for the notification server is `9020`. Client software must use this same service port. If the port number is determined to be incorrect, fix it and restart the client software applications. Reboot the PC if necessary.

5.3 Starting/Stopping Notification Service

When the server is rebooted or shutdown, it runs the `/etc/init.d/femis` script, which start or stops the Notification Service using the following scripts in the `/home/femis/bin` directory.

5.3.1 Starting Notification Service

The `/home/femis/bin/start notify` script uses the EOC List File (`./etc/eoclist.dat`) to determine how to start the Notification Service. The file tells how many Notification Service processes to start, which ports to use; and which other Notification Services to communicate with. You can run the following script.

```
% startnotify
```

If the Notification Service(s) is already running, you cannot start new ones.

To start Notification Service(s) with logging turned on, you can run the following script.

```
% startnofify -log
```

5.3.2 Stopping Notification Service

The `/home/femis/bin/stopnotify` script stops the Notification Service(s) by finding all processes running the `femis_event` program and then kills them using `kill -2`. You can run the following script.

```
% stopnotify
```

6.0 FEMIS Command Server

Command server online documentation is provided in three man pages on the UNIX server. Log onto the EOC's server as `femis` and enter:

```
% man cmdservd
% man cmdserv.conf
% man cmdserv
```

`cmdservd` is the command server daemon. `cmdserv.conf` is the command server configuration file. `cmdserv` is a UNIX test client for the command server.

6.1 cmdservd - FEMIS Command Server Daemon

6.1.1 Synopsis

```
cmdservd [-conf config-file]
cmdservd [-conf config-file] [-v] [-syntax [-show] [-check]]
```

6.1.2 Availability

The FEMIS command server daemon `cmdservd` executable, configuration file, test client, and related files are delivered in the FEMIS distribution tar file on magnetic tape or CD. The default locations for these files are `/home/femis/bin` and `/home/femis/etc` on the FEMIS UNIX data server.

6.1.3 Description

FEMIS utilizes remote command servers, executing on a UNIX host computer so PC workstation users can launch large mathematical model/simulation programs. These include the Evacuation SIMulation (ESIM), a module in the Oak Ridge Evacuation Modeling System (OREMS).

The command server is also utilized in certain FEMIS system administration functions, e.g., starting-stopping notification.

A high degree of security is realized in this command server because:

- Security problematic command servers such as `rsh` and `.rhosts` are not used. A client node need not be a trusted host.
- A command server runs only as a non-privileged, non-root process.
- A command server is forked as a child of *inetd*, eliminating the need to maintain socket connections.
- The command server does not execute raw UNIX commands. Rather it looks up necessary commands in a configuration file and matches parameters with arguments based on messages from the client.
- The command server is very limited in what it can do. Only those commands and functions defined in the `cmdserv.conf` configuration file can be invoked. Even if a cracker were to gain access to the `cmdservd` service port and sockets, it could not be used to cd around the file system, examining password files, and the like.
- Files written are only those temporary and output files written by the target executable. All communication between command server and forked process takes place via memory and unnamed pipes only.
- Passwords and other sensitive data is sent on the client-to-server socket encrypted. Clear passwords are never sent to the application on the command line, to possibly be displayed by `ps`.
- The user and client machine making requests to run programs on a command server are verified prior to running any entry. Several methods are utilized to block requests from anyone except authorized users.

6.1.4 Options

The command server has two basic execution modes: daemon and command line. In daemon mode, execution is started and controlled by the *inetd* internet daemon and runs as a detached process. In command line or interactive mode, `cmdservd` runs in response to a user entry. Command line mode is used mainly to check on the syntax of new configuration files.

The default configuration file name is `cmdserv.conf`, and its default path is `/home/femis/etc`. To change either the configuration file name or path, use the `-conf` option. Possible formats for use with the `-conf` option are as follows:

```
1% cmdservd -conf filename
2% cmdservd -conf subdirectory/
3% cmdservd -conf subdirectory/filename
4% cmdservd -conf /fullpathname/
5% cmdservd -conf /fullpathname/filename
```

Case 1 Syntax contains no slashes (/), and thus no path or directory names. The argument to `-conf` is the name of a file which resides in the default configuration directory `/home/femis/etc`.

Case 2 Syntax is in subdirectory format and contains a slash (/) as the last character. The first character is not a `/`, thus a relative path and not an absolute path. The described syntax tells `cmdservd` to use the default file name in a subdirectory of the default path.

Case 3 Syntax specifies a subdirectory and file name. The named file is thus located in the subdirectory of the default path.

Case 4 Syntax specifies to look for the default file name `cmdserv.conf` in the full path specified in the option. Both first and last character of the option are slashes (/).

Case 5 Syntax specifies a full path and file name. None of the defaults apply in this case.

Option `-v` asks `cmdservd` to display its version information. Example:

```
virus% cmdservd -v
cmdservd version 1.0 - Wed Feb 14 14:41:00 PST 1996
```

Options `-syntax` invokes only the `cmdservd` syntax checker.
Options `-show` and `-check` are used in conjunction with `-syntax`.

The `-syntax -check` options cause `cmdservd` to process the configuration file, checking for syntax problems. Options `-syntax -show` cause `cmdservd` to compile the configuration file, check for syntax problems, and display the resulting linked structure.

6.1.5 Syntax Check

To check the syntax of a command server configuration file, enter the options `-syntax -check` to `cmdservd`, examples:

```
1% cmdservd -syntax -check           # check default
2% cmdservd -syntax -check -conf CFG # check CFG file
```

The following format is output by `-syntax -check`. Any line detected with suspect syntax is reported. Output of the listing is of the format:

```
Line ##: LINE-FROM-FILE
    ERROR-MESSAGE
    ERROR-MESSAGE
```

Where *##* is the line number, `LINE-FROM-FILE` is the text from the configuration file at line *##*, and `ERROR-MESSAGE` is a list of error messages describing the problems. Example:

```
Line 13: badnews
    invalid block/directive type code
```

The following list provides all possible error messages and their probable cause:

```
invalid block/directive type code
```

A block name or directive name is not one of those allowed. The block names are ALL, ACCESS, HOST, SITE, and ENTRY. Directive names are site, deny, allow, executable, directory, password, outfile, errfile, argument, environment, file, and put.

`block requires no parameters`

The ALL and ACCESS blocks do not require a list of parameters, i.e., [BLOCKNAME par1 par2 ...].

`block requires exactly 1 parameter`

The ENTRY block requires exactly one parameter which is the entry item name, e.g., [ENTRY abc], where abc is the name of a program.

`block requires 1 or more parameters`

The HOST and SITE blocks require at least one parameter which is a list of host or site names. HOST and SITE cause conditional compile. If the current host or site is the same as an item in the list, compilation continues. Otherwise, compilation of this program block is blocked.

`directive not valid outside a block`

All directives must be contained inside a block.

`ENTRY block can not include other blocks`

It is invalid for an [ENTRY ..] block to contain other blocks (at this time).

`directive must be inside HOST block`

The site directive is only valid inside a HOST block.

`directive must be inside ACCESS or ENTRY block`

The allow and deny directives are only valid inside for an ACCESS or ENTRY block.

`directive must be inside ENTRY block`

Directives executable, directory, password, outfile, errfile, file, put, and argument are only valid inside an ENTRY block.

`environment must be inside ENTRY ALL SITE or HOST block`

The environment directive must be inside of an ENTRY, ALL, SITE, or HOST block. When inside ENTRY, the variable is evaluated for that entry item only. When inside ALL, SITE, or HOST, the variable is evaluated whenever the block condition is TRUE, and not evaluated if the block condition is FALSE.

`ACCESS block can only contain deny and allow`

An ACCESS block can not contain anything but deny and allow.

`site requires exactly 1 parameter`

`Site` directive requires exactly one parameter. Zero parameters and two or more parameters are invalid syntax.

`directive requires 1 or 2 parameters`

`Allow` and `deny` directives require exactly one or two parameter. Zero parameters and three or more parameters are invalid syntax.

`invalid character(s) in IP address field`

Internet Protocol (IP) address field in the `deny` and `allow` directives can contain only digits 0-9 and the period (.) characters. Anything else is invalid syntax. A format specification is not valid in allow or deny directives.

`invalid character(s) in IP subnet mask`

IP subnet mask in a `deny` or `allow` directive can contain only digits 0-9 and the period (.) characters. Anything else is invalid syntax.

`invalid IP address`

IP address numbers must be in the range 0-255.

`invalid IP subnet mask`

Only the numbers 255, 254, 252, 248, 240, 224, 192, 120, and 0 are valid IP subnet mask elements. The value 0 must be followed by 0. The value 255 must be preceded by 255. A value not 0 or 255 can appear only once. For example, 255.255.255.192, 255.255.255.0, 255.255.128.0.

`directive requires format [parameters]`

Directives `executable, directory, password, outfile, errfile, file, put, argument`, and `environment` require a format string and an optional list of parameters. Examples:

```
executable /home/femis/bin/command/xyz
directory  /home/femis/user/%s/ DIRECTORY
```

`only %s allowed in format`

Format strings in this language allow only the `%s printf` conversion. Conversions, such as `%d, %x, %u`, are not allowed.

`format and number of parameters do not match`

The number of parameters included and the number required by the format string do not agree.

`executable path/file affected by client`

Structure of the configuration file program that generates the executable path/file string is affected by external environment variables sent in the client message. Such affects are illegal. Executable must be developed only from static values and environment variables local to the configuration file.

`password affected by client`

Structure of the configuration file program that generates the password string is affected by external environment variables sent in the client message. Such affects are illegal. The password must be developed only from static values and environment variables local to the configuration file.

6.1.6 Installation

The installation process copies files `cmdservd`, `cmdserv`, and `cmdserv.conf` to directory `/home/femis/bin` and `home/femis/etc`. There files are required to be at this path, unless modifications are made to the `/etc/inetd.conf` and `cmdserv.conf` files.

FEMIS Install adds the following line to the `/etc/services` file to define the command server service port name:

```
femis-cmdserv  9015/tcp  fxcmdserv  # command server
```

FEMIS Install adds the following single line to the `/etc/inetd.conf` file to add the command server to the *inetd* internet daemon:

```
fxcmdserv stream tcp \
    nowait femis /home/femis/bin/cmdservd cmdservd
```

6.1.7 Protocol

Only Transmission Control Protocol (TCP) connection and reliable messages are ever used in the FEMIS command server daemon (`femiscomd`). User Datagram Protocol (UDP) is not used.

The FEMIS command server and a client program carry on a two way half duplex conversation. After successful connection has completed, the server and client exchange hello messages. The server hello message contains encryption seeds for the session. The client hello message contains optional mode flags, used to characterize certain server- client exchanges.

Once hello messages have been exchanged, `cmdservd` then listens for command messages from the client which contain the necessary parameters and instructions for running a specific program on the UNIX server.

After receiving a command, the command server looks for that entry in the configuration file. Actual UNIX commands and the format of arguments come from the configuration file, not from the socket input.

After completing the set up for a computation, the `femiscomd` forks and executes the specified executable and then goes back to listening for client commands.

6.1.8 Messages

This section describes messages which pass between server and client over TCP socket connections.

6.1.8.1 Message Format

Messages to/from command server and its client have the following general format:

```
<op:OPERATION|...|...|...><NEWLINE>
```

Every message begins with < and ends with > followed by an end-of-line. Only characters between < and > have any meaning. The end-of-line character, and anything between > and < have no meaning and should be ignored by both client and server.

Between < and > are an unspecified number of fields, the first one being the operation field. Fields are separated by the | character. Fields can contain any number of characters, or may be empty, i.e., ||.

Within a field, four characters are escaped: <> | and \. The back slash \ is the escape character.

Note: The field separators < > and | never appear in a correctly encoded field.

The following mappings apply:

Decoded	Encoded
<	\L
>	\R
|	\D
\	\E

6.1.8.2 Message Fields

All message field identifiers are two lower case characters followed by a colon. The identifiers are as follows:

Field	Contents
op:	Operation or function name
ac:	Action code: run, status, kill
pw:	Password field
ev:	Parameter (environment) values
rc:	Return code
er:	Error code
k0:	Key #0 for light encryption (not used)
k1:	Key #1 for light encryption (not used)
k2:	Key #2 for light encryption (not used)
mo:	Modes: alert test ... (client hello only)

6.1.8.3 Operation Codes

The current message operation codes currently are implemented in the command server, the command server's test client, or both:

Code	Description
op:SVRHELLO	Server hello
op:CLIHELLO	Client hello
op:MISCINFO	Miscellaneous info
op:EOF	End-of-file
op:COMMAND	Command directive
op:HELP	Help
op:HELPINFO	Help information
op:QUIT	Quit
op:ERROR	Error to client
op:REPLY	Reply to client
op:ALERT	Alert the client

6.1.8.4 Command Message

```
<op:COMMAND|ac:ACTION|pw:PASSWD|ev:PAR1|ev:PAR2|...>
```

Where ACTION is run ENTRY, status, or kill; PASSWD is a password string; PAR1 PAR2 are parameter defines; and ENTRY is the name of an entry in the configuration file.

This message is constructed by the client and sent to the server. It tells the server what entry from the configuration file to invoke. It tells the server what values to use for arguments and environments.

The PASSWD password string should be blank if the entry contains no password definition. If password is present, it must be a 16+ characters password value. The first eight characters are the HWID hex value. The next eight characters are the client port hex value. Following characters are the user's password string.

Parameters are utilized in the command server as environment variables. Each parameter specification `PAR1 PAR2` defines an environment variable, e.g., `X=1, CRANK=24-99, NAME=xyz, DB=CTOO`. The environment variables thus defined are passed to the configuration file processing and become inputs for building application arguments, input files, and environment. Also see *cmdserv.conf* man page.

6.1.8.5 Error Messages

```
<op:ERROR|er:MESSAGE>
```

Where `MESSAGE` is the error message from the command processor. The following lists possible errors:

```
can't access client data
can't access client data: PERROR
    - Call to getpeername(socket) failed.
    - PERROR is message returned from perror().

config file open failed
config file open failed: PERROR
    - Open the configuration file failed.
    - PERROR is message returned from perror().

config file syntax error on lines LINELIST
    - Execution of command server has been terminated
      because there is one or more syntax errors in the
      configuration file.
    - LINELIST is a list of line numbers with errors.
    - Correct the syntax errors and retry.  Use -syntax and
      -check options to see details of the syntax problems.

access denied
    - The configuration file allow and deny directives in
      ENTRY or ACCESS block on the server host ban this
      command (or all) from client's IP address.

invalid command
    - Content of message is not a valid command.

no action
    - No valid action was specified.

no password
    - A password is required and none was sent.

wrong password prefix
    - Either HWID or PORT has wrong value.

unknown action
    - Action code in COMMAND message not valid.
    - Valid actions are run status kill.
```

```
wrong password
    - Password supplied is not one required by configuration
      file.

can't set directory
can't set directory:  PERROR
    - Cannot change directory to the one specified.
    - PERROR is message returned by perror().

already active
    - The command server daemon is already executing a
      process.  Either kill or wait for alert.

can't execute program
    - Either fork() or execvp() failed.  This probably
      happened because there's something wrong with the
      executable file or the name specified.

no executable
    - The named executable file was not found.  There may be
      something wrong with the path, or the file name.
```

6.1.8.6 Reply Messages

```
<op:REPLY|rc:MESSAGE>
```

Where MESSAGE is the reply message from the command processor. The following lists possible replies:

```
   successful
   - command completed successfully

   finish TIMESTAMP IDENT
   - STATUS is execution finished
   - TIMESTAMP also used in log file names
   - IDENT is the UNIX process id number

   killed TIMESTAMP IDENT
   - STATUS is execution killed
   - TIMESTAMP also used in log file names
   - IDENT is the UNIX process id number

   active TIMESTAMP IDENT
   - STATUS is execution still in progress
   - TIMESTAMP also used in log file names
   - IDENT is the UNIX process id number

   not active
   - No process has been executed.
Alert Message
-------------

<op:ALERT|rc:MESSAGE>
```

Where MESSAGE is the process completion status:

```
finish TIMESTAMP IDENT
-  STATUS is execution finished
-  TIMESTAMP also used in log file names
-  IDENT is the UNIX process id number

killed TIMESTAMP IDENT
-  STATUS is execution killed
-  TIMESTAMP also used in log file names
-  IDENT is the UNIX process id number
```

6.1.8.7 Message Example

```
From server    From client
-----------    -----------
<op:MISCINFO|ITEM1|ITEM2|...>
<op:SVRHELLO|k0:|k1:|k2:>
               <op:CLIHELLO|k1:|k2:|mo:alert>
               <op:COMMAND|ac:run test|
                          pw:|ev:A=73|ev:B=Dog|ev:X=Cat>
<op:REPLY|rc:active 9602141130 12933>
               <op:COMMAND|ac:status|pw:>
<op:REPLY|rc:active 9602141130 12933>
               <op:COMMAND|ac:status|pw:>
<op:REPLY|rc:active 9602141130 12933>
<op:ALERT|rc:finish 9602141130 12933>
```

6.1.9 Service Port and Name

The cmdservd service port number currently is 9015. The short name is femis-cmdserv or fxcmdserv.

6.1.10 Files

Files utilized during the installation and execution of the FEMIS command server include the following:

- /home/femis/bin/cmdservd — daemon executable
- /home/femis/etc/cmdserv.conf — configuration file
- /home/femis/bin/cmdserv — test client (UNIX)
- /etc/services — service port numbers
- /etc/inetd.conf — internet daemon config

6.2 cmdserv.conf - FEMIS Command Server Configuration File

6.2.1 Availability

The FEMIS command server configuration file `cmdserv.conf` is delivered in the FEMIS distribution on magnetic tape or CD. The default location of the file is `/home/femis/etc` on the FEMIS UNIX data server.

6.2.2 Description

This configuration file provides specific configuration information to the FEMIS command server daemon `cmdservd`. Unlike problematic remote compute servers such as RSH, the FEMIS command server provides some degree of security through this configuration file.

Security is also realized by placing severe limits on what this command server is allowed to do. Only those procedures defined in the configuration file are possible to be spawned. Even if a cracker were to gain access to the `cmdservd` service port and sockets, it could not be used to cd around the file system, examining password files, and the like.

Additional security is realized through an encrypted password mechanism. `Cmdservd` currently uses simple encryption, with RSA or SSL planned for the future.

The FEMIS project, and a CSEPP site administrator have the ability to configure allowed and denied clients on a per site basis. Allow and deny directives give the administrator the ability to allow individual workstations in the local Emergency Operation Center (EOC), or a remote EOC, but deny all others. Specification of allowed and denied workstations is based on IP address.

The processes used in the command server daemon to parse its configuration file is similar to how LEX/YACC generated parsers work. In LEX, a parser reads text according user defined rules. Output of the lex analyzer is handed to the compiler YACC which builds a complex linked structure. The linked structure provides a simple mechanism for the process to scan the input program, without having to reread and reparse the input files.

In the command server daemon, the source code is read by a text parser function. This parser recognizes only two general source constructs: block and directive. Block is the outer level construct, and directive the inner level. A block can contain other blocks or directives. Directives are stand alone, do not contain other directives or blocks.

6.2.3 Syntax

A configuration file contains block, directive, and comment syntax constructs.

A line starting with a # character in column 1 is a comment. Any # character, not part of a string, begins a comment to the end of that line. Example:

```
# a comment line
argument %s XYZ   # comment to end-line
argument %s YZX   # another comment ...
```

A block identification begins with the [character and ends with]. All blocks are terminated by [END]. General block syntax is as follows:

```
[BLOCK]  or  [BLOCK parameters]
...          ...
[END]        [END]
```

Directive lines begin with a keyword, followed by zero or more parameters. Directive parameters can be additional keywords, or a quoted string. General directive syntax is as follows:

```
directive
directive parameter
directive format-string
directive format-string parameters
```

General syntax of a command server configuration file is as follows:

```
# comments
[BLOCK declaration]
directives
more blocks
[END]
more blocks
```

6.2.4 Block Syntax

The command server configuration language utilizes five block types: ACCESS, ENTRY, HOST, SITE, and ALL. A block statement always begins with the [(left bracket) character, followed by the block type name. Whether parameters are required is a function of block type.

The block types and their summary purpose are as follows:

```
Block Type        Purpose
----------        -------
[ACCESS]          Begin access specification block
[ENTRY entname]   Begin entry block (conditional)
[HOST hostlist]   Begin host block (conditional on host)
[SITE sitelist]   Begin site block (conditional on site)
[ALL]             Begin unconditional block
[END ...]         Marks end of a block
```

In ACCESS block, a parameter after the block type is not required nor is one allowed. Likewise, the ALL block does not require a following parameter, nor is one allowed.

An ENTRY block requires one and only one parameter, the entry name.

The HOST and SITE blocks require a list of one or more parameters, where the parameters are names of hosts or names of sites.

The END statement must have the characters [ENDxxx], where xxx is zero or more unprocessed characters, i.e., the parser scans only for [END. Characters xxx are only for commentary purposes, i.e., [END of block]. Every block must be terminated by an [END] statement, which marks the end of the block.

A simple example of command server configuration file structure follows:

```
#
# a comment line
#
[HOST princess queen]  # if host is princess or queen
[ENTRY travelcost]     # then define entry travelcost
...
[END of travelcost]
[ENTRY distance]       # and define entry distance
...
[END of distance]
[END of princess queen]
```

A detailed description of each block type follows:

6.2.4.1 ACCESS Block

Through an ACCESS block, the FEMIS project or a CSEPP site administrator can configure allowed and denied access to command server resources on a site's UNIX data server.

Two (and only two) directives are permitted in an ACCESS block: allow and deny. The ENTRY block also permits allow and deny directives.

When allow and deny appear in an ENTRY block, they specify what workstations can execute the specific entry. When allow and deny appear in an ACCESS block, they specify what workstations can execute any entry in the configuration file. An ACCESS block may be placed inside of HOST or SITE blocks, thus adding site-by-site conditional use.

The parameter of allow and deny directives are in the form of an IP address. This parameter can be in the form of an specific host address, or a subnet designation.

The parameters of allow and deny can be a full absolute IP address, a partial IP address with an assumed mask, or an IP address with a mask. The assumed mask is 255.255.0.0 or 255.255.255.0. A zero in any field of the IP address means wild card. At this time, only subnet masks 255.255.0.0 and 255.255.255.0 have any meaning. A zero in any field of the IP address means wild card.

Correct use is to first deny everything via deny `0.0.0.0` and then one at a time allow subnets and/or specific IP addresses that exist at the site or EOC.

An address match refers to the client computer's IP address. If the client IP address Boolean-anded with by the IP mask equals the IP address in the allow or deny directive, the match is set `TRUE`. If they are not equal then `FALSE`.

The following example allows access by all IP addresses on the PNL-Net, except for workstations `wd_millard` and `merlin`. Access by addresses on the PNL Remote subnet (remote dial-in) are also allowed. The entire world outside PNL-Net and PNL-remote are denied access.

```
[SITE PNL]
[ACCESS]
deny  0.0.0.0        # deny world
allow 130.20.0.0     #allow pnl-net...
deny  130.20.92.40   # deny wd_millard
deny  130.20.76.40   # deny merlin
[END of ACCESS]
[END of PNL]
```

6.2.4.2 HOST Block

The format of a `HOST` block declaration is as follows:

```
[HOST host1 host2 host3 ...]
```

Where: `host1 host2` is a list of one or more host names.

The `HOST` block is a conditional block which is compiled only if the server host, on which the command server daemon `cmdservd` is executing, is contained in the list of permitted hosts, i.e., the `HOST` block parameter list.

The following example defines the site to be PNNL, only if the name of the command server host is `virus, locusts, temblor`, or `mirage`. The example code fragment also sets up access for the site.

```
[HOST   virus locusts temblor mirage]
site    PNNL           # site name is PNNL
[END]
[SITE PNNL]
[ACCESS]
deny    0.0.0.0        # deny whole world
allow   130.20.92.0    # allow isb1-400-pod subnet
allow   130.20.194.0   # allow pnl-femis-1 subnet
allow   130.20.210.0   # allow pnl-femis-2 subnet
allow   130.20.226.0   # allow pnl-femis-3 subnet
allow   130.20.242.0   # allow pnl-femis-4 subnet
[END]
[END]
```

6.2.4.3 SITE Block

The format of a SITE block declaration is as follows:

```
[SITE site1 site2 ...]
```

Where: site1 site2 is a list of one or more site names.

The SITE block is a conditional block which is compiled only if the server host, on which the command server daemon cmdservd is executing, is within one of the sites listed. Specific site is determined by the site directive.

In the following example, the ENTRY definitions are compiled only of the local host is in one of the named sites: PNNL, TEAD, and UMDA.

```
[SITE PNNL TEAD UMDA]
[ENTRY import]
...
[END]
[ENTRY execute]
...
[END]
[END]
```

6.2.4.4 ALL Block

The command server configuration file syntax rules require that all directives be contained inside of a block. Thus, a directive cannot be placed at the outer most level, as only blocks are allowed at that level.

In most cases, directives are not needed except inside blocks. However, there are special cases where placing a directive at the outer most block is necessary. The ALL block effectively allows that case. The ALL block is like a conditional block that is always TRUE. It might be used where a HOST or SITE block would be used, however the ALL block always compiles.

One special case that requires an ALL block is definition of global environment variables. Consider the following example:

```
[ALL]
environment DATABASE fi7
[END]
[HOST virus]
environment DATABASE fi6
[END]
```

In the example above, environment database is first defined to be fi7, all the time. Then if the host is virus, DATABASE is redefined to be fi6.

6.2.4.5 ENTRY Block

An ENTRY block defines a block of code that is used in the command server to set up the execution of a child subprocess. The command, script, or executable to be spawned can be a compiled program, a Bourne script, a C Shell script, or a PERL script.

The executable directive tells the command server where to find the entry's application file. Other directives set up arguments, parameters, and data being passed to the application.

The directive types permitted within an ENTRY block are as follows:

```
executable, directory, password, outfile, errfile, argument,
environment, file, put, allow, and deny.
```

The parameter in the ENTRY statement is the entry name, which the command server matches with the parameter in a run command message from a client. See *cmdservd(1)* man page. Example:

```
<op:COMMAND|ac:run entry-name|...>
```

6.2.5 Directive Syntax and Semantics

In the command server configuration language, blocks define the structure of a configuration program, and directives define actions to be executed at some point.

Directives are coded on a single line, which do not begin with the [(left bracket) or # (comment) character. Generally, a directive consists of the directive type name, followed by an optional format statement, followed by one or more parameters.

Directives utilize a format string which appears much like the format strings of the C programming language. In this language, only the %s conversion type is valid, i.e., `%d %x %u` are not supported and, if included in a format, produce an error. Any number of `%s` conversions can appear in a format string. This is the way in which data from the client program is passed on to the application.

The parameters in a directive statement can be a simple string or the name of an environment variable. Environment names utilized get their values from the `COMMAND:run` messages from a client. In the example below, variables `A`, `B`, and `C` get values `1`, `73`, and `88X`. All values are string values. Example:

```
<op:COMMAND|ac:run x|ev:A=1|B=73|C=88X|...>
```

Following is a table of directives in the command server language:

Directive	Purpose
site	Define the name of a site
executable	Define name of executable file
directory	Define default directory
password	Define password
outfile	Name the stdout file
errfile	Name the stderr file
argument	Specify a command line argument
environment	Specify an environment variable
file	Open and write a file
put	Put record into opened file
allow	Allow access by client
deny	Deny access by client

Three methods have been provided in the command server configuration language for copying input parameters to the application: `argument`, `environment`, and `file/put`. Argument generates an application command line argument. Environment creates an environment variable that then gets duplicated in the application. File and put create a file which can be read by the application.

6.2.5.1 Site Directive

The site directive defines the name of the site. This site name is then utilized in `SITE` blocks to conditionalize other blocks.

The site directive is only valid inside a `HOST` block. Example:

```
#
[HOST virus locusts temblor mirage]
site  PNL
[END]
#
[HOST cemsun tcemsun]
site  UTAH
[END]
#
[SITE PNL]
environment DATAPATH /files3/home/femis/data/pnl/
[END]
[SITE UTAH]
environment DATAPATH /files1/home/femis/data/utah/
[END]
#
[ENTRY xyz]
...
argument %s DATAPATH
[END]
```

Note: The same thing could be accomplished by using only the `HOST` block. However, `SITE` provides a convenient shorthand way to group a list of hosts that exist at the different `CSEPP` sites.

In the example above, the environment variable DATAPATH is changed depending on site value. Placing the definition of DATAPATH outside the ENTRY blocks helps to decrease the amount of configuration file code necessary.

6.2.5.2 Executable Directive

The executable directive provides the command server daemon with the executable file name. Possible formats are as follows:

```
executable file-name
executable format parameter-list
```

Where `file-name` is an absolute. Only string data type is supported--no integer or floating data.

Format is a `cmdserv` allowed format (see above). Parameter list is a list of internal environment variable names. The number of environments in the list must match the number of `%s` designators in the format string.

The executable directive requires that the environment variables used to generate the file name must be internal only. For this directive, external (client) environments are not allowed. The command server daemon does not allow the client to override the value of a previously specified environment if that environment is then used in the name of an executable, which would constitute a significant security hole.

Examples:

```
executable /home/femis/bin/import.sh

environment EXEPATH /home/femis/bin/esim/
executable  %s/import.sh  EXEPATH
```

In examples above, the first example is valid because it is static and does not involve environments. The second example also is valid, provided the client does not over ride the value of environment EXEPATH.

6.2.5.3 Directory Directive

The directory directive provides the command server daemon with the path to use for current directory prior to running the application. See *chdir(2)* man page. Possible formats are as follows:

```
directory path-name
directory format parameter-list
```

Where `path-name` is an absolute. Only string data type is supported--no integer or floating data.

Format is a `cmdserv` allowed format (see above). `Parameter-list` is a list of environment variable names, which may be either internal and/or external (client generated). The number of environments in the list must match the number of `%s` designators in the format string.

If `cmdservd` can not set directory to the specified path, it returns an error message to the client, and does not run the application.

6.2.5.4 Password Directive

The password directive provides the command server daemon with the password to use for this application. The password string can be blank. If the password directive is omitted, it is assumed to be blank. A blank password means that password checking is not performed in `cmdservd` prior to running the application. Possible formats are as follows:

```
password password-string
password format parameter-list
```

Where `password-string` is the full password specification. Only string data type is supported--no integer or floating data.

Format is a `cmdserv` allowed format (see above). `Parameter-list` is a list of internal environment variable names. The number of environments in the list must match the number of `%s` designators in the format string.

The password directive requires that the environment variables used to produce the password string must be internal only. For this directive, external (client) environments are not allowed. The command server daemon does not allow the client to override the value of a previously specified environment if that environment is then used in a password directive, which would constitute a significant security hole because the client could specify its own password.

If the password directive specifies a non-blank string, `cmdservd` then requires the client to send a password string in the `COMMAND` message. That password must match the one generated in the password directive. If a match is not realized, `cmdservd` returns an error message to the client, and does not run the application. Examples:

```
password georgewashington

password Elisabeth-2

environment SPORT Baseball
environment TEAM SeattleMariners
environment PLAYER KenGriffyJr
password %s-%s TEAM PLAYER
```

The first and second examples specify valid passwords because they are static and do not involve any environments. The third example also is valid, provided the client does not over ride the value of environments `TEAM` or `PLAYER`.

6.2.5.5 Outfile Directive

The outfile directive tells the command server daemon the file name of where to write the application's standard output. If no `/path` is included in the outfile directive, the file will be written to the default directory.

If outfile and errfile specify the same string, only one file is created and `stdout` and `stderr` point to the same descriptor.

Possible formats are as follows:

```
outfile file-name
outfile format parameter-list
```

Where `file-name` is a full or partial file specification. Only string data type is supported--no integer or floating data.

Format is a `cmdserv` allowed format (see above). `Paramete-list` is a list of environment variable names, which may be either internal and/or external (client generated). The number of environments in the list must match the number of `%s` designators in the format string.

6.2.5.6 Errfile Directive

The `errfile` directive tells the command server daemon the file name of where to write the application's standard error. If no `/path` is included in the errfile directive, the file will be written to the default directory.

If `errfile` and `outfile` specify the same string, only one file is created and `stdout` and `stderr` point to the same descriptor.

Possible formats are as follows:

```
errfile file-name
errfile format parameter-list
```

Where `file-name` is a full or partial file specification. Only string data type is supported--no integer or floating data.

Format is a `cmdserv` allowed format (see above). `Parameter-list` is a list of environment variable names, which may be either internal and/or external (client generated). The number of environments in the list must match the number of `%s` designators in the format string.

6.2.5.7 Argument Directive

The argument directive tells `cmdservd` to copy the directive parameter(s) to the application's command line arguments in the order given. See *execve(2)* man page. Possible formats are as follows:

```
argument argument-string
argument format parameter-list
```

Where `argument-string` is one full argument in string format. Only string data type is supported--no integer or floating data.

Format is a `cmdserv` allowed format (see above). `Parameter-list` is a list of environment variable names, which may be either internal and/or external (client generated). The number of environments in the list must match the number of `%s` designators in the format string. Examples:

```
argument -x
argument inputfile.dat
argument %s-%s  TEAM  PLAYER
```

6.2.5.8 Environment Directive

An environment directive tells `cmdservd` to define an environment variable in `cmdservd` process space. See *setenv(1)* and *putenv(3)* man pages. Environment variables can be used to generate the other application attributes, i.e., arguments, directory, file names. Environment variables also are inherited by the child process, and thus can be used to transmit data to the application.

In some cases, this method of transmitting input parameters to the child has an advantage over using the argument directive. Those situations include when security is an issue, because using UNIX can make arguments visible via the `ps` command.

Possible formats are as follows:

```
environment env-name env-value-string
environment env-name format parameter-list
```

Where `env-name` is the environment variable name. `Env-value` string is the environment variable value. Only string data type is supported--no integer or floating data.

Format is a `cmdserv` allowed format (see above). `Parameter-list` is a list of environment variable names, which may be either internal and/or external (client generated). The number of environments in the list must match the number of `%s` designators in the format string.

Note: Environment variables, subsequently used in executable or password directives, which are affected by the client message, are not allowed. The command server daemon terminates the entry, and does not run the specific application, because to do so would constitute a security hole. In other words, the client can not specify its own password nor its own executable file. Only the configuration file can do that.

Examples:

```
environment OPTION -x
environment SPORT  BBall
environment TEAM   ChicagoBulls
environment PLAYER Jordan
environment TEAMPLAYER  %s.%s  TEAM  PLAYER
```

6.2.5.9 File Directive

The file directive instructs `cmdservd` to create and open a new file to receive records. Records are written to the file via the `put` directive.

Possible formats are as follows:

```
file file-name
file format parameter-list
```

Where `file-name` is either a full or partial file specification. If a relative file name, the default directory is utilized as the starting point.

Format is a `cmdserv` allowed format (see above). `Parameter-list` is a list of environment variable names, which may be either internal and/or external (client generated). The number of environments in the list must match the number of `%s` designators in the format string. Examples:

```
file /home/femis/user/evlog/10000745/e0/
file /home/femis/user/evlog/%s/e%s/pf CASE EXER
```

In the first example, the file directive uses a full path specification involving no variables. The second example utilizes two variables `CASE` and `EXER`, assumed to be sent by the client.

A command server configuration file entry can utilize multiple file directives, in which case multiple files are created.

6.2.5.10 Put Directive

The put directive instructs `cmdservd` to copy one record into the file created and opened by the most recent file directive.

Possible formats are as follows:

```
put record-text
put format parameter-list
```

Where record-text is the actual and full record text to be copied into the currently opened file.

Format is a `cmdserv` allowed format (see above). `Parameter-list` is a list of environment variable names, which may be either internal and/or external (client generated). The number of environments in the list must match the number of `%s` designators in the format string. Examples:

```
put "The quick brown fox jumped over the lazy dog."
put %s-%s CASE EXER

environment ANIMAL elephant.
put "The quick brown fox jumped ofer the %s." ANIMAL
```

The first example copies a fixed static string into the file. The second utilizes a format string and two environment variables. The third example uses a quoted string as the format and one environment variable. The ANIMAL value could be provided in a message from the client.

6.2.5.11 Allow Directive

A description of the allow directive is also included in ACCESS block documentation. Combinations of allow and deny can be used in ACCESS and ENTRY blocks to describe the permitted users of the command server.

Syntax of the allow directive is the keyword allow, followed by an IP address or subnet, followed by an optional subnet mask, followed by an optional comment.

Format of IP address and subnet mask currently is four decimal numbers, in the range 0-255, separated by decimal point. Allowed IP address elements are 0-255.

Allowed IP mask elements are 0, 128, 192, 224, 240, 248, 252, 254, and 255. Subnet mask must be in the format 255...XXX.0..., where 255 can appear one, two or three times; 0 can appear one, two, or three times; and XXX (not 0 or 255) can appear only one time. Examples:

```
allow 0.0.0.0                       # world
allow 130.20.0.0    255.255.0.0     # pnl net
allow 192.101.108.0 255.255.255.0 # pnl-remote
allow 130.20.92.131                 # workstation
allow 201.8.44.64 255.255.255.224 # subnet
```

6.2.5.12 Deny Directive

A description of the deny directive is included in the ACCESS block documentation. Combinations of allow and deny can be used in ACCESS and ENTRY blocks to describe the permitted users of the command server.

Syntax of the deny directive is the keyword allow, followed by an IP address or subnet, followed by a subnet mask, followed by optional comments.

Format of IP address and subnet mask currently is four decimal numbers, in the range 0-255, separated by decimal point. Allowed IP address elements are 0-255.

Allowed IP mask elements are 0, 128, 192, 224, 240, 248, 252, 254, and 255. Subnet mask must be in the format 255...XXX.0..., where 255 can appear one, two or three times; 0 can appear one, two, or three times; and XXX (not 0 or 255) can appear only one time. Examples:

```
deny 0.0.0.0                        # world
deny 196.104.8.0                    # subnet
deny 130.20.92.87                   # workstation
deny 201.8.44.32 255.255.255.224 # subnet
deny 201.8.44.96 255.255.255.224 # subnet
```

6.3 cmdserv - FEMIS Command Server Test Client (UNIX)

6.3.1 Synopsis

```
cmdserv [-v] [-h] [-D] [IPaddr] | [hostname] | [-] [port]
```

6.3.2 Availability

Program `cmdserv` is a test client for use with the FEMIS command server daemon `cmdservd`. The command server, test client, and related files are delivered in the FEMIS distribution tar file on magnetic tape or CD. The default locations for these files are `/home/femis/bin` and `/home/femis/etc` on the FEMIS UNIX data server.

6.3.3 Description

FEMIS utilizes remote command servers, executing on a UNIX host computer in order that PC workstation users can launch large mathematical model/simulation codes, which on the PCs either could not be run at all or would require an unreasonable amount of time and resources. These include the Evacuation SIMulation (ESIM), a module in the Oak Ridge Evacuation Modeling System (OREMS).

The command service consists of a client and server. The client runs on a Windows NT workstation. The server runs on UNIX and is capable of spawning processes at the request of a remote client.

This program is a client for use on the UNIX platform. Its purpose is mainly for testing the command server, for testing of new configuration file scripts, and for testing executables.

6.3.4 Options

The command server test client `-v` option produces a listing of current version information. Example:

```
virus% cmdserv -v
cmdserv version 1.0 - Wed Feb 14 14:41:00 PST 1996
```

The `cmdserv -h` option produces a help listing:

```
virus% cmdserv -h
usage: cmdserv [-hvD] [IPaddr | host] [port]
      -v     : display version information
      -h     : display help messages
      -D     : display diagnostic messages
       IPaddr : host IP address, e.g., 130.20.92.87
```

```
host    : server's host name, e.g., cemsun
port    : service port number, e.g., 9015
```

The `cmdserv -D` option turns on diagnostics.

Normally, the destination port is `9015`, the standard service port for the FEMIS command server. Certain testing activities may require changing the `cmdserv` port number, thus the option to place it on the command line.

The destination host must be specified either as an IP address, or as a host name. One or the other must be specified, but not both. The local host can be designated as the command server daemon by including minus-sign (-) in place of the IP address or host name. Examples:

```
virus% cmdserv locusts
virus% cmdserv virus
cemsun% cmdserv tcemsun
cemsun% cmdserv cemsun
virus% cmdserv -
virus% cmdserv 130.20.92.87
locusts% cmdserv 130.20.28.43
```

6.3.5 Installation

See the *cmdservd(1)* man page.

6.3.6 Protocol

See the *cmdservd(1)* man page.

6.3.7 Operation

Run the command service test client by entering `cmdserv`. `Cmdserv` first tries to connect with the command server daemon, `cmdservd`. Generally, any I/O error during execution of the test client will cause it to terminate. The possible errors during client operation are as follows:

```
cmdserv: create socket failed: PERROR
-  Call to socket() library function to create a socket
failed with the error indicated.

cmdserv: convert IP address failed: PERROR
-  Call to inet_addr() library function failed with the
error indicated.

cmdserv: HOST - unknown host: PERROR
-  Call to gethostbyname() library function failed with
the indicated error.
```

```
cmdserv: HOST-OR-IP - connect failed: PERROR
-  The connect() library function call failed because
of the indicated error.

cmdserv: HOST-OR-IP - can't get socket info: PERROR
-  Call to getsockname() library function failed because
of the indicated error.

cmdserv: read failed: PERROR
-  Call to recv() library function to receive a message
on a socket failed with the error indicated.

cmdserv: send failed: PERROR
-  Call to send() library function to transmit a message
on a socket failed with the error indicated.
```

Where HOST-OR-IP will be either the destination host name or the destination IP address depending on how the command line was entered. And PERROR represents an error message returned from `perror()`.

Once `cmdserv` receives control from the shell, it opens a connection to the specified destination host, and prompts for an action:

Action

Prior to entering anything, wait for the server and client hello messages to be exchanged. `Cmdserv` displays two to three messages. Example:

Received

```
<op:MISCINFO|
    program argv : cmdservd|
    program argc : 1|
    current dir  : /files0/home/larryg/femis/command/log|
    config file  : \LNull\R|
    daemon uid   : 1033|
    getpeername  : clen : 16|
    getpeername  : gprc : 0|
    client port  : 2377|
    client host  : hattrick.pnl.gov|
    client IPadd : 130.20.92.87|
    hwid number  : 82145C57|
    server key   : \LNull\R|
    client key   : \LNull\R|
    process id   : 10332|
    parent id    : 146>
```

Received

```
<op:SVRHELLO|F2BBE247|********|********>
```

Sending

```
<op:CLIHELLO|********|********|mo:alert test >
```

Action

At this point, enter one of the following:

```
run X           : runs entry X from configuration file
status          : returns status of current application
kill            : kills the current application
```

After entering `run X`, `cmdserv` prompts for a password.

Password

Either enter the password required by the configuration file or just enter return if none is required. Also see the configuration file *cmdserv.conf(5)* man page.

`Cmdserv` next prompts for any number of parameters. Parameters must be of the form `VARIABLE=VALUE`, where `VARIABLE` is the name of a variable in the command server, and `VALUE` is the value to be assigned.

> **Note:** All values are string values. Numeric, integer, or floating point data is not supported in this implementation.

Once all parameters have been entered, type return or `^D`.

As soon as the command server processes the command and starts the application, it sends a message back to `cmdserv`, which is displayed:

Received

```
<op:REPLY|rc:active TIMESTAMP PROCESS>
```

Where `TIMESTAMP` is a 10 character time stamp, e.g., `9602071334`, and `PROCESS` is the PID of the child process.

While the application is executing, entering status acquires status of the application process. Once the application has terminated, the command server sends an alert message and `cmdserv` displays:

Received

```
<op:ALERT|rc:finish TIMESTAMP PROCESS>
```

Where `TIMESTAMP` and `PROCESS` are the same as above.

Now enter another command or exit via `^C` or `^D`.

6.3.8 Messages

Any of the possible command server daemon (`cmdservd`) error messages and reply messages can be received in the test client and thus be displayed on its standard output. See the *cmdservd(1)* man page.

6.3.9 Configuration File

See the *cmdserv.conf(5)* man page.

6.3.10 Service Port And Name

The `cmdserv` service port number currently is `9015`. The short name is `femis-cmdserv` or `fxcmdserv`.

6.3.11 Files

Files utilized during the installation and execution of the FEMIS command server include the following:

```
/home/femis/bin/cmdservd       daemon executable
/home/femis/etc/cmdserv.conf   configuration file
/home/femis/bin/cmdserv        test client (UNIX)
/etc/services                  service port numbers
/etc/inetd.conf                internet daemon config
```

7.0 FEMIS Met Application Suite

The FEMIS Met application suite gathers meteorological (Met) data for FEMIS.

7.1 Overview

The FEMIS Met application suite consists of a number of programs on several different computers. Starting from the source of the meteorological (Met) data, there is either a Handar Met Collection System or the FEMIS PC Met simulator program (`METSIM.EXE`), which runs on a normal MS-DOS computer. Both of these arrangements send the meteorological (Met) data through a serial line to the FEMIS PC Met server program (`FXCOMMPC.EXE`), which runs on a normal FEMIS Windows computer. It, in turn, sends the meteorological (Met) data through a socket to the FEMIS UNIX Met daemon program (`fxcommd`), which runs on the FEMIS onpost UNIX computer. This program sends the data to the FEMIS UNIX Met loader program (`fcmetld`), which also runs on the FEMIS onpost UNIX computer. There is also a FEMIS UNIX Met simulator program (`fxcomdrv`) which runs on the FEMIS onpost UNIX computer and can be used to validate the installation of the FEMIS Met application suite on the UNIX computer.

7.1.1 Software Components

The software components consist of the following:

FEMIS PC	Met simulator	-	`METSIM.EXE`
FEMIS PC	Met server	-	`FXCOMMPC.EXE`
FEMIS UNIX	Met daemon	-	`fxcommd`
FEMIS UNIX	Met loader	-	`fcmetld`
FEMIS UNIX	Met simulator	-	`fxcomdrv`

7.1.2 Hardware Components

The hardware components consist of the following:

Handar Met Collection System
FEMIS Met simulator PC - MS-DOS
FEMIS Met server PC - Windows NT or Window For Workgroups
FEMIS onpost UNIX computer - Solaris v2.5.1
Serial null modem cable to connect Handar/simulator to server.

7.2 FEMIS PC Met Simulator - METSIM.EXE

7.2.1 Overview - METSIM.EXE

The FEMIS PC Met simulator program reads captured raw meteorological (Met) data from a file and sends it over a serial line to the FEMIS Met server PC which runs the FEMIS PC Met server program, `FXCOMMPC.EXE`. It is intended to be used for testing or exercise purposes, since the Handar Met Collection System will be sending the actual real-time meteorological (Met) data.

`METSIM.EXE` can be run on essentially any dedicated PC platform that can support an MS-DOS (version 3.3 or higher) environment. On the low end, it has been tested on a PC-XT Clone with a 4.77 MHz 8088 processor running MS-DOS 3.3. On the high end, it has been tested on a 90 MHz Pentium machine running Windows NT 3.51. `METSIM.EXE` requires a serial port (`RS-232C`) to send data to the platform running `FXCOMMPC.EXE`, together with a null modem cable.

`METSIM.EXE` requires one file to run, usually called `met.dat`, which contains raw meteorological (Met) data generated by the Handar Met Collection System.

`METSIM.EXE` runs as follows:

1. Process command line options to determine communication settings and the tower data file. If you do not specify the tower data file, the default is `met.dat` in the current directory.

2. Set the communication parameters. The defaults are as follows:

   Delay - 900 seconds (15 minutes)
   Port - Com2
   Baud - 1200
   Data Bits - 8
   Stop Bits - 1
   Parity - NONE.

3. Process the tower data file (`met.dat`) by reading a block of data from the file and sending a tower data block at a time over the serial port to the FEMIS Met server PC. After sending data for each of the towers, wait a bit to simulate the actual Handar Met Collection System, which sends data every 15 minutes. Then send more tower data blocks. This process continues until all data in the file has been transmitted.

7.2.2 Installation - METSIM.EXE

To install the FEMIS PC Met simulator

1. Run the `FEMIS Setup` program.

2. Specify a directory on a clean floppy disk on to which to copy the files.

3. Select the `Met Simulator` option.

4. Specify a site code.

   Note: There is currently captured meteorological (Met) data for only Utah (TEAD) and Kentucky (LBAD).

5. Move to the FEMIS Met simulator PC and copy the files from the floppy to the hard disk using the following command.

   ```
   COPY A:\*.* C:\
   ```

The FEMIS PC Met simulator program is now installed.

7.2.3 Directories and Files - METSIM.EXE

The FEMIS PC Met simulator program requires two files, which can be placed anywhere on the FEMIS Met simulator PC, though `C:\FEMIS\MET` is the recommended location.

`METSIM.EXE` - FEMIS PC Met simulator program
`MET.DAT` - input data file

You might also create a `METSIMGO.BAT` file to run `METSIM.EXE`.

7.2.4 Command Line Options - METSIM.EXE

`METSIM.EXE` accepts the following command line options:

`-b` Specifies the baud rate. The default is 1200.

`-c` Specifies the COM port number (1 or 2). The default is 2.

`-d` Specifies the number of data bits (7 or 8). The default is 8.

`-p` Specifies the parity (E=even, O=odd, N=none). The default is none.

`-s` Specifies the number of stop bits (0, 1, or 2). The default is 1.

`-w` Specifies the wait in seconds between tower data blocks. The default is 900 (15 minutes).

`-f` Specifies the complete file name of the input file with the meteorological (Met) data. The default is `met.dat`.

`-u` Displays the available command line options.

`-t` Test mode: Initialize and exit. This is not the default.

`-v` Verbose mode: Show all data sent to the port. This is not the default.

7.2.5 METSIMGO.BAT Driver Script - METSIM.EXE

You might want to create a `METSIMGO.BAT` file which has the settings you will normally use when running `METSIM.EXE`. The single command will be something like:

```
C:\FEMIS\MET\METSIM.EXE -b9600 -c2 -d8 -pN -s1 -w900
-fC:\FEMIS\MET\MET.DAT
```

If you put the batch in a directory which is in the path, you will be able to run the PC Met simulator from any directory.

Then type `METSIMGO` to run the PC Met simulator. It will start sending data to the PC Met server.

7.2.6 Troubleshooting - METSIM.EXE

The two major classes of `METSIM.EXE` problems are

1. Missing or invalid input files
2. Invalid communication parameters.

7.2.6.1 Cannot Find Input Data File

```
* * * MSG:  Opening input file:  file
file:  No such file or directory
```

You specified an invalid input data filename with the `-f` option or the `met.dat` file is not in the current directory.

7.2.6.2 Invalid Communication Parameters

```
* * * MSG:  Status from setting COM port=STATUSCODE
* * * ERR:  Initializing.  Aborting...
```

You will always see the first message, but you will only see the second message if `STATUSCODE` is not zero. This occurs if there is an error initializing the COM port. Check all the settings by looking at all the messages which follow `Initializing com port...`.

7.2.6.3 Non-METSIM Errors Involving Communications

If `FXCOMMPC.EXE` is running but does not indicate that it is receiving any data, then you might think the problem is in `METSIM.EXE`. However, if `METSIM.EXE` is running and shows normal status messages, then the communications parameters are probably incorrect in either `FXCOMMPC.EXE` or `METSIM.EXE`. To correct the problem, stop both programs, noting what

communication parameters FXCOMMPC.EXE is using. Then start METSIM.EXE and note what values are used for the communication parameters (baud rate especially). Verify that both programs are using the same values (except for possibly COM port). Next, on the FEMIS Met server PC, start the Windows Terminal program, and configure its communication settings to be the same as in FXCOMMPC.EXE. You should start receiving data from METSIM.EXE in the window. If not, then the cable may have a broken wire or it may not be a null modem cable. Once you correct that problem and the data from METSIM.EXE starts appearing in the window, then you can stop Terminal and restart FXCOMMPC.EXE, setting the communication parameters, and clicking the Run button. Data should start appearing in the window.

Note: Some of the captured meteorological (Met) data is bad--it does not match the defined format--so even if METSIM.EXE sends it, FXCOMMPC.EXE will ignore it and not display it in the window. Historically, about 10% of the data is bad.

7.3 FEMIS PC Met Server - FXCOMMPC.EXE

7.3.1 Overview - FXCOMMPC.EXE

The FEMIS PC Met server program, which runs on the FEMIS Met server PC, receives raw meteorological (Met) data from either the Handar Met Collection System or from the FEMIS PC Met simulator program. After parsing and validating the data, it sends the data via socket to the FEMIS UNIX Met daemon on the FEMIS onpost UNIX computer.

FXCOMMPC.EXE requires a platform that provides serial port (RS-232C) connectivity, a network connection with WinSock compatibility, and a Windows NT environment within which to run. The RS-232 serial connection to the METSIM.EXE platform requires only pins 1 (Hardware ground), 3 (DTE RxD), and 7 (Data ground) to be connected (a null modem cable). This application only receives; it does not transmit. No hardware handshaking is used or required.

FXCOMMPC.EXE runs as follows:

1. If it exists, process the configuration file, FXCOMMPC.CFG in the current directory, and set the communication parameters. Otherwise, use some default values, probably not valid for your site, and you will need to set serial parameters and TCP parameters before clicking the Run button.

2. Once the form pops up, you must configure the Serial or TCP parameters. Any changes you make will be saved to the configuration file.

3. If you have configured everything to your satisfaction, click the Run button and the program sits there waiting for data to come through the COM port. The program needs no further action from you.

4. After receiving some data, parse and validate it, before sending it via a socket to the FEMIS onpost UNIX computer where it will be loaded into the FEMIS onpost Oracle database by the daemon and loader programs.

5. Wait for more data.

7.3.2 Installation - FXCOMMPC.EXE

To install the program, run the FEMIS Setup program and select only the Met server option. Remember to create an icon for the program.

The FEMIS PC Met server program is now installed. You should be able to double click the icon for `FXCOMMPC.EXE` and run the program.

7.3.3 Configuration - FXCOMMPC.EXE

The main form contains two menu items, `File and Configure`. `File` has the Exit option to quit the `FXCOMMPC` application. `Configure` contains two submenu items, `SerialPort` and `TcpPort`. There are also two buttons, `Run` and `Stop`. `Run` establishes the connection to the remote server, opens the serial communications port, initializes the 4 hertz timer, and enters the processing loop. The `Stop` button stops sending data.

The `SerialPort` submenu item loads the form to allow setting serial port parameters. The parameters that can be set are Baud Rate, number of Data Bits, number of Stop Bits, Parity, and COM Port. In the current version, only `Com1:` through `Com4:` are valid options. It also supports only one serial port at a time. Future versions may include the capability of a serial port multiplexor board.

The `TcpPort` submenu item loads the form to allow setting the Local Host Name (that is, the name of the host running `FXCOMMPC.EXE`), the Remote Host Name (the name of the host running the FEMIS UNIX Met daemon), and the TCP port number that is being serviced by the daemon. The `SerialPort` and `TcpPort` submenu items are disabled when the `Run` menu item is selected.

The main form contains several areas:

- `Run` button--Opens the network connection and sends data
- `Stop` button--Closes the network connection
- A frame containing text fields that show the Remote Host Name, the Port Number in use, and the State of the network connection (Disconnected, Connected, Listening)
- A frame containing the text fields that show the COM Port in use, the serial port Settings of the selected COM Port, and the State of the COM Port (`OPEN, CLOSED`)

- A text box that displays the entire contents of each tower data block that has been successfully parsed. The previously parsed tower data blocks can be seen by scrolling in the text box.

  Note: Known Bug: Until you select either of the options from the Configure menu and click OK on the form, FXCOMMPC will not run, even though it appears that all the settings are correct.

7.4 FEMIS UNIX Met Daemon - fxcommd

7.4.1 Overview - fxcommd

The FEMIS UNIX Met daemon, `fxcommd`, runs on the FEMIS onpost UNIX computer and passes data it receives via a socket to the FEMIS UNIX Met loader program, `fcmetld`. `fxcommd` is an *inetd*-compliant daemon. It has a dedicated TCP port through which it receives messages from the platform that runs the `FXCOMMPC.EXE` application. Because `fxcommd` runs as a background process, there is no user interface associated with it. To load the meteorological (Met) data into the FEMIS database, `fxcommd` creates a data file and then uses the system function "execl" to create a process that runs the executable `fcmetld`. This operation is accomplished by a forked child process; therefore, if any error occurs, it will not affect the running of the `fxcommd` process. `fxcommd` creates a log file, `/home/femis/log/fxcommd.log`, and error messages from `fxcommd`, plus some from `fcmetld`, will be in it for tracking down problems. If there is an error trying to call the `fcmetld` program, usually because there are too many processes running already on the system, then `fxcommd` will create an error file, `/home/femis/log/f.*.err`.

Use of an *inetd* daemon provides several benefits. If a fatal error is encountered, the process will terminate, but it will be invoked again automatically when the next connection request arrives at the network port. As with all *inetd* processes, the socket coding is transparent to the application developer. Reads-from and writes-to the sockets are accomplished by reads from `stdin` and writes to `stdout`, respectively.

7.4.2 Installation - fxcommd

All the files associated with `fxcommd` are installed in the proper location by the FEMIS UNIX install script.

```
/home/femis/bin/fxcommd
/home/femis/etc/fxcommd.cfg
/etc/services
/etc/inetd.conf
```

7.4.3 Directories and Files - fxcommd

`fxcommd` uses the following default directory structure and files:

```
/home/femis/bin/                - executable
/home/femis/etc/                - configuration file
/home/femis/log/                - output data files
/home/femis/bin/fxcommd         - executable program
/home/femis/etc/fxcommd.cfg     - configuration file
/home/femis/log/fxcommd.log     - output log file
/home/femis/log/f.*.dat         - output data file
/home/femis/log/f.*.err         - output error file.
```

7.4.4 Configuring System Files - fxcommd

`fxcommd` requires an entry in `/etc/services`, such as:

```
fxcommd 9037/tcp
```

It also requires an entry in `/etc/inetd.conf`, such as:

```
fxcommd stream tcp nowait femis /home/femis/bin/fxcommd
```

These system configuration file entries register the `fxcommd` daemon with the network daemon *inetd*. The file specification shown above for the entry in `/etc/inetd.conf` must contain the correct path to the `fxcommd` executable.

These files are both modified during installation by the FEMIS UNIX Installation script. You may not need to change them later.

7.4.5 Restarting inetd - fxcommd

If you change an entry in the `/etc/inetd.conf` file, then you must force the *inetd* daemon to reload the file to make those changes take effect. This is done by restarting the daemon by performing the following procedure.

1. Login as `root`.

2. Find the process ID of the *inetd* daemon

   ```
   % /bin/ps -ef | grep inetd
   ```

3. Restart the daemon with the HUP signal

   ```
   % kill -HUP pid
   ```

The pid is the process ID of the daemon.

Note: If you use the `ps` command again, it will appear that daemon has not restarted (the date and time did not change).

7.4.6 Command Line Options - fxcommd

`fxcommd` accepts a few command line options, even though it is run from the `/etc/inetd.conf` file. These options are as follows:

`-i <configuration file>`	Specifies a non-standard (not `/home/femis/bin/fxcommd.cfg`) configuration file. This is provided to allow non-standard installations of FEMIS (not in `/home/femis`) and multiple instances of Met, one loading real data and the other exercise data.
`-help`	Show the command line options and exit.
`-v`	Show the version of `fxcommd` and exit.
`-V`	Show the version and RCS version of `fxcommd` and exit.

Invalid command line options are flagged but ignored.

Note: You can run `fxcommd` from the command line and specify the `-v, -V,` and `-help` options.

7.4.7 Configuration File - fxcommd

`fxcommd` requires a configuration file, the default being `/home/femis/etc/fxcommd.cfg`. You can override the default by using the -i command line option in the `/etc/inetd.conf` file.

Note: The file is automatically configured during installation, but you may need to change it later.

`fxcommd.cfg` contains the following settings:

1. `PATH <path variable>`
   (recommend `/home/femis/bin:/usr/bin:$ORACLE_HOME/bin`)

2. `ORACLE_SID <sid>`

3. `ORACLE_HOME <directory for Oracle>`

4. `LD_LIBRARY_PATH <directory for run-time libraries>`

   These Oracle environment variables should be set as in the `~femis/.oraclerc` file, though the FEMIS UNIX Installation script should set them in this file automatically.

5. `FXLOGFILE <log file for fxcommd>`
(recommend `/home/femis/log/fxcommd.log`)

   File in which `fxcommd` writes status and error messages. It is also the file in which fcmetld will put startup error messages that can occur before it opens its own log file.

6. `FCEXEFILE <name of fcmetld program>`
(recommend `/home/femis/bin/fcmetld`)

   Name of the `fcmetld` program that `fxcommd` will execute. The only reason this would ever be different is because femis was not installed under `/home/femis`.

7. `FCCFGFILE <name of fcmetld configuration file>`
(recommend `/home/femis/etc/fcmetld.cfg`)

   Name of the configuration file for `fcmetld`, which `fxcommd` will pass if it is not the default. This is the means by which one can have more than one installation of the Met software, one loading real data, the other loading exercise data. `fxcommd` and `fcmetld` would simply use different configuration files.

8. `METDIR <met directory>`
(recommend `/home/femis/log`)

   The directory in which `fxcommd` places data files which `fcmetld` will load.

   Note: If you changed the directory structure for `fcmetld` (using the `METDIR` option), you must also change it to be exactly the same for `fxcommd`.

9. `DEBUG <number> or NODEBUG`
(recommend `NODEBUG`)

   The debug level (`off, 0-2`), which controls the detail of messages in the log files. If Met is loading fine and has for days, then use `NODEBUG`. If it will not load at all, then use `DEBUG 0` to find the general reason. To track the problem down further, you may need `DEBUG 1` or even `DEBUG 2`.

Note: Blank lines and lines beginning with "#" are treated as comments and ignored.

7.4.8 Troubleshooting - fxcommd

The three major classes of `fxcommd` problems are

1. Missing or invalid configuration file
2. Too many processes
3. Problems reading from the socket.

7.4.8.1 NON-FATAL: Invalid Command Line Option

```
* * * ERR:  Invalid command line option
```

This is a non-fatal error which you will only see if you run `fxcommd` from the command line. However, it is useful to verify that the command specified in the `/etc/inetd.conf` file will work.

7.4.8.2 FATAL: Invalid -i Command Line Option

```
* * * ERR:  No config file specified with -i option
```

You will only see this error if you run `fxcommd` from the command line. However, it is useful to verify that the command specified in the `/etc/inetd.conf` file will work. It means that the `-i` option was specified on the command line but no configuration file was specified after it.

7.4.8.3 FATAL: Cannot Find the Configuration File

```
* * * ERR:  n Opening config file
```

You will only see this error if you run `fxcommd` from the command line. Either the `/home/femis/etc/fxcommd.cfg` file or the file specified with the -i option cannot be found.

7.4.8.4 FATAL: Cannot Find the fcmetld Program

```
/home/femis/bin/fcmetld: Command not found
```

This may occur if the FEMIS UNIX Met loader program cannot be found. Either the file really does not exist, or the `fxcommd.cfg` file is incorrect. While `fxcommd` will continue to run, none of the meteorological (Met) data will be loaded. You need to fix the configuration file or find the missing program and then kill the `fxcommd` process. When it restarts, it may be able to find the `fcmetld` program.

7.4.8.5 FATAL: Cannot Find the Run-Time Library

```
ld.so.1:/home/femis/bin/fcmetld:fatal:libclntsh.so.1.0: cannot
open file = errno=2
```

The `LD_LIBRARY_PATH` variable is not set correctly in the `fxcommd.cfg` file or the `/home/femis/lib/libclntsh.so.1.0` is missing.

7.4.8.6 FATAL: Cannot Fork Before Calling the fcmetld Program

```
* * * ERR:  Fork failed with errno=n
* * * ERR:  Fork failed with pid=pid
```

This may occur if there are too many processes already running on the machine. While `fxcommd` may continue to run, it means that some of the meteorological (Met) data will not get loaded.

7.4.8.7 FATAL: Cannot Call the fcmetld Program

```
* * * ERR:  Exec failed with errno=n
```

This may occur if there are too many processes already running on the machine. While `fxcommd` may continue to run, it means that some of the met data will not get loaded.

7.4.8.8 FATAL: Error Reading Data from the Socket

```
* * * ERR:  Reading (len):  rc=n
```

OR

```
* * * ERR:  Reading (buf):  rc=n
```

The program was expecting some data and something happened while trying to read from the socket. The accompanying error message may give more information.

7.5 FEMIS UNIX Met Loader - fcmetld

7.5.1 Overview - fcmetld

The FEMIS UNIX Met loader, `fcmetld`, runs on the FEMIS onpost UNIX computer and loads meteorological (Met) data into the Oracle database from files created by `fxcommd`. It is run from the FEMIS UNIX Met daemon, `fxcommd`, via a system "execl" call. `fxcommd` passes the timestamp (`-t` option) which is used to calculate the name of the input data file created by `fxcommd` and the output log file created by `fcmetld`. `fxcommd` may also pass a configuration file (`-i` option) on the command line, which `fcmetld` will use instead of the default one.

`fcmetld` requires the configuration files `fcmetld.cfg` and `mettower.dat`. The `fcmetld.cfg` file controls where the files are located and how to put the data into Oracle. The `mettower.dat` file tells `fcmetld` how to interpret the actual meteorological (Met) data (what kind of data from which sensor). It **must** be exactly the same as the `mettower.dat` file that is used by the FEMIS PC Met simulator or the Handar Met Collection System.

`fcmetld` also needs a data file created by `fxcommd`, named something like `/home/femis/log/f.*.dat`, where * is the time in seconds and microseconds since 01/01/70 00:00:00 (SSSSSSSSSS.MMMMMMMMMM). These files are generated by the `fxcommd` daemon for each block of tower data received from the FEMIS PC Met server or the FEMIS UNIX Met simulator.

`fcmetld` creates a log file corresponding to each data file named `/home/femis/log/f.*.log`. `fcmetld` also creates a shell script named `/home/femis/log/f.*.csh` which is used to send notification of new meteorological (Met) data via `fev` to the PCs.

Note: Periodically, the files in `/home/femis/log` should be archived and deleted. If there are 10 Met towers, each sending data every 15 minutes, there will be 2x10x4x24=1920 files per day or about 15,000 per week (and 750,000 per year). Each of the files will be small, especially if debugging is turned off, but that is still a lot of files. You may want to cleanup the old files at the same time you archive the data in the Oracle tables (using the `archive.sh` program).

7.5.2 Installation - fcmetld

All the files associated with `fcmetld` are installed in the proper location by the FEMIS UNIX Installation script.

```
/home/femis/bin/fcmetld
/home/femis/etc/fcmetld.cfg
/home/femis/log/
```

7.5.3 Directories and Files - fcmetld

The `fcmetld` program uses the following default directory structure and files:

`/home/femis/bin/`	- executable
`/home/femis/etc/`	- configuration file
`/home/femis/log/`	- input data and output log files
`/home/femis/data/met/xxxx/`	- tower configuration file
`/home/femis/bin/fcmetld`	- executable program
`/home/femis/etc/fcmetld.cfg`	- configuration file
`/home/femis/log/fxcommd.log`	- output log file
`/home/femis/log/f.*.dat`	- input data file
`/home/femis/log/f.*.log`	- output log file
`/home/femis/log/f.*.csh`	- output C-shell script
`/home/femis/data/met/xxxx/mettower.dat`	- tower configuration file.

7.5.4 Command Line Options - fcmetld

`fcmetld` accepts a few command line options, even though it is run from `fxcommd`. These options are as follows:

`-t <timestamp>`	Timestamp used to name data file. The format is sssssssss.mmmmmmmmmm, which is the time in seconds and microseconds since 01/01/70 00:00:00. `fxcommd` passes `-t` when it calls fcmetld. The data file will be in the `METDIR` directory and named `f.<timestamp>.dat`. The log file created by `fcmetld` be in the same directory and named `f.<timestamp>.log`.

`-f <data file>`	The actual full name of the data file to load. The `-f` option is only provided for test purposes, since `fxcommd` does not use it. The name for the log file created by `fcmetld` will be `<data file>.log`.
`-i <configuration file>`	Specifies a non-standard (not `/home/femis/etc/femetld.cfg`) configuration file. This is provided to allow non-standard installations of FEMIS (not in `/home/femis`) and multiple instances of Met, say one loading real data and the other exercise data.
`-purge`	Cleanup the Met files in the `/home/femis/log` (`METDIR`) directory. It deletes all the `f.*.dat, f.*.log, f.*.csh`, and `fxcommd.log` files. Depending on the number of files, it may take a long time to complete.
`-[no]debug <level>`	The debug level (`off, 0-2`) controls the detail of messages in the log files. If Met is loading fine and has for days, then use `NODEBUG`. If it will not load at all, then use `DEBUG 0` to find the general reason. To track the problem down further, you may need `DEBUG 1` or even `DEBUG 2`. The default is `NODEBUG`.
`-help`	Show the command line options and exit.
`-v`	Show the version of `fcmetld` and exit.
`-V`	Show the version and RCS version of `fcmetld` and exit.

Invalid command line options are flagged and `fcmetld` will quit.

7.5.5 Configuration File - fcmetld

`fcmetld` requires a configuration file, the default is `/home/femis/etc/fcmetld.cfg`. The configuration file for `fxcommd` actually specifies the name of the configuration file for `fcmetld` using the `FCCFGFILE` option. If it is not the default, then `fxcommd` passes the name of the file to `fcmetld` using the `-i` command line option.

Note: The file is automatically configured during installation, but you may need to change it later.

`fcmetld.cfg` contains the following settings:

1. `ORACLE <username/password>`

   The Oracle database account username/password should be for the FEMIS onpost database.

   Note: The password is not encrypted.

2. `CONFIG <tower configuration filename>`
(recommend `/home/femis/data/met/tead/mettower.dat`)

   The name of the tower configuration file, which tells which sensors go with which towers. Currently, the only other file available is `/home/femis/data/met/lbad/mettower.dat`.

3. `METDIR <met directory>`
(recommend `/home/femis/log`)

   The directory in which `fxcommd` places data files that `fcmetld` will load. It is also the directory in which `fcmetld` will place log files.

   Note: If you changed the directory structure for fxcommd (using the `METDIR` option), you must also change it to be exactly the same for `fcmetld`.

4. `FEVHOST <hostname>`

   The name of the UNIX computer on which the FEMIS onpost database is located. Actually, the name of any of the FEMIS servers can be specified, though the standard installation will set it correctly. You can also specify "-", which means "the current machine." For more information, see the `/home/femis/etc/eoclist.dat` file.

5. `FEVPORT <port number>`

   The TCP/IP port number of the FEMIS notification server to which notification of new meteorological (Met) data will be sent. It should be the port for the `FEVHOST` described above. The standard installation will set it correctly. Refer to the `/home/femis/etc/eoclist.dat` file for more information.

6. `EXERCISE <number>`

   The exercise into which the meteorological (Met) data will be loaded in the Oracle database. Because the incoming data does not say whether it is real or exercise, you must set this value to control it.

   Note: Exercise number 0 is real data, which means that if you want to load both real and exercise meteorological (Met) data, you would need two sets of Met configuration files on the FEMIS onpost UNIX computer.

7. `DEBUG <number> or NODEBUG`
(recommend `NODEBUG`)

   The debug level (`off, 0-2`), which controls the detail of messages in the log files. If Met is loading fine and has for days, then use `NODEBUG`. If it will not load at all, then use `DEBUG 0` to find the general reason. To track the problem down further, you may need `DEBUG 1` or even `DEBUG 2`.

8. `NOWTIME or REALTIME`
(recommend `NOWTIME`)

The time used for the data collection time for the meteorological (Met) data. `NOWTIME` says to use the current system time, whereas `REALTIME` says to use the time the meteorological (Met) data was actually collected.

Note: `REALTIME` is what EMIS uses.

9. `DOTZ or NODOTZ`
(recommend `DOTZ`)

Controls whether the data collection time is converted from local time to GMT before storing it in the database. You would only use `NODOTZ` if you have a version of FEMIS before version 1.1.7.

Note: Blank lines and lines beginning with "#" are treated as comments and ignored.

7.5.6 Troubleshooting - fcmetld

The five major classes of `fcmetld` problems are

1. Invalid command line or configuration file options
2. Errors connecting to Oracle
3. Errors reading any of the input files
4. Invalid meteorological (Met) data
5. Errors updating the database.

7.5.6.1 Invalid Command Line Options

```
* * * ERR:  Invalid option
```

Either you or `fxcommd` specified an invalid command line option. Use `-h` to see the valid options.

7.5.6.2 Missing Command Line Option

```
* * * ERR:  -t or -f option is required
```

Either you or `fxcommd` did not specify the `-t` or `-f` command line option, one of which must be used. Use `-h` to see the valid options.

7.5.6.3 Trouble Opening the Configuration File

```
* * * ERR:  n Opening config file
```

The specified configuration file probably does not exist. Either you specified a bad filename with the `-i` option, or `fxcommd` pass a bad filename because the `FCCFGFILE` entry in the `fxcommd.cfg` file is wrong.

7.5.6.4 Missing Oracle Entry

```
* * * ERR:  Oracle username/password not set
```

The `Oracle` entry is not specified in the `fcmetld.cfg` file.

7.5.6.5 Missing Tower Configuration File Entry

```
* * * ERR:  Tower Config file not set
```

The `Config` entry is not specified in the `fcmetld.cfg` file.

7.5.6.6 NON-FATAL: Missing Tower Count Entry

```
* * * ERR: # Towers not set -- using 20
```

The `Towers` entry is not specified in the `fcmetld.cfg` file.

7.5.6.7 Not Enough Memory to Load Tower Configuration File

```
* * * ERR: n Allocating Tower Info
```

There was not enough memory to load the tower configuration file.

7.5.6.8 Trouble Opening the Tower Configuration File

```
* * * ERR:  n Opening config file
```

The specified tower configuration file probably does not exist. The `Config` entry in the `fcmetld.cfg` file is probably wrong.

7.5.6.9 Trouble Reading the Tower Configuration File

```
* * * ERR:  n Reading config file
```

There was some sort of error reading the tower configuration file, probably because it was empty or missing some required entries.

7.5.6.10 Trouble Opening the Tower Data File

```
* * * ERR: n Opening Tower Data file
```

The specified tower data file probably does not exist. Either you specified an invalid `-t` or `-f` option, or `fxcommd` passed an invalid `-t` option.

7.5.6.11 Empty Tower Data File

```
* * * ERR: No data records in tower data file
```

The tower data file was empty or included only information for sensors which FEMIS ignores.

7.5.6.12 Tried to Process Information for an Unknown Tower

```
* * * ERR:  Invalid tower
```

OR

```
* * * ERR:  Tower not in configuration file
```

The meteorological (Met) data is for a tower that the tower configuration file does not define.

7.5.6.13 Could Not Connect to Oracle

```
* * * ERR:  n Connecting
```

This is the single most likely error you will see. The probable causes are

- Oracle entries in `fxcommd.cfg` are incorrect
- Oracle is not running.

7.5.6.14 Trouble Determining Tower Name

```
* * * ERR:  n Getting tower name
```

The incoming meteorological (Met) data includes a tower ID, but the FEMIS Oracle database uses a different value (a tower name) to identify the tower. `fcmetld` was unable to determine the name by looking into the Met tower table, given the ID.

7.5.6.15 Trouble Getting Current Time

```
* * * ERR:  n Getting current date/time
```

The SQL query to determine the current time was not successful.

7.5.6.16 Trouble Converting Date from Julian

```
* * * ERR:  n Converting Julian day
```

The incoming meteorological (Met) data includes the date the information was collected as a Julian day. It must be converted to the actual date (mm/dd/yy) before being stored in the database, but there was some sort of error trying to convert it.

7.5.6.17 Trouble Changing Current Met to Historical Met

```
* * * ERR:  n Changing current met to historical met for tower
```

When meteorological (Met) data is added to the database, the most recent meteorological (Met) data is changed from current to historical. There was an error doing that.

7.5.6.18 Trouble Adding the Met Data to Oracle

```
* * * ERR:  n Adding met data for tower
```

There was an error inserting a record for the new meteorological (Met) data into the Met condition table.

7.5.6.19 Trouble Committing the Database Updates

```
* * * ERR:  n Disconnecting
```

There was an error committing the database updates, so the data may have been added to the database, or it may not have been added.

7.5.6.20 FATAL: Cannot Find the Run-Time Library

```
ld.so.1:/home/femis/bin/fcmetld:fatal:libclntsh.so.1.0: cannot
open file = errno=2
```

The `LD_LIBRARY_PATH` variable is not set correctly in the `fxcommd.cfg` file or the `/home/femis/lib/libclntsh.so.1.0` is missing.

7.6 FEMIS UNIX Met Simulator - fxcomdrv

7.6.1 Overview - fxcomdrv

The FEMIS UNIX Met simulator, `fxcomdrv`, uses a file created by the `FXCOMMPC.EXE` program, and sends one tower of meteorological (Met) data at a time through the specified port to the specified UNIX computer. It can be used for testing the installation of the FEMIS Met application suite on the UNIX computer.

`fxcomdrv` is a simple socket-based data driver for use in testing `fxcommd` and `fcmetld`. It uses a data file that has been created by the PC application `FXCOMMPC.EXE`. This data file contains parsed and formatted meteorological (Met) data. `fxcomdrv` makes a socket connection to `fxcomdrv` and then sends individual tower data blocks across the socket with delays between each tower data block.

7.6.2 Installation - fxcomdrv

All the files associated with `fxcomdrv` are installed in the proper location by the FEMIS UNIX Installation script.

```
/home/femis/bin/fxcomdrv
/home/femis/bin/fxcomdrv.sh
/home/femis/data/met/xxxx/*
```

7.6.3 Directories and Files - fxcomdrv

The `fcmetld` program uses the following default directory structure and files:

`/home/femis/bin/`	- executable and configuration file
`/home/femis/data/met/*/`	- tower configuration and data files
`/home/femis/bin/fxcomdrv`	- executable program
`/home/femis/bin/fxcomdrv.sh`	- driver script
`/home/femis/data/met/*/fxcommpc.out`	- data file
`/home/femis/data/met/*/mettower.dat`	- tower configuration.

7.6.4 Command Line Options - fxcomdrv

The following command line options are accepted by `fxcomdrv`:

`-v`	Show the version of `fxcomdrv` and exit.
`-V`	Show the version and RCS version of `fxcomdrv` and exit.
`-help`	Show the command line options and exit.
`-zeropass`	Normally used with `-debug 2` to show settings. It does not actually send any data to the port.
`-[no]onetower`	Send a block of data for a single Met tower and then exit. The default is multi-tower (`-noonetower`).
`-[no]onepass`	Send all the data in the input data file and then exit or restart. The default is multi-pass (`-noonepass`), which is an infinite loop. When it reaches the end of the file, it restarts from the beginning.
`-file <data file>`	Name of the file which contains captured meteorological (Met) data from the Handar Met Collection System as processed by the FEMIS PC Met server. In other words, it is the output file from `FXCOMMPC.EXE`. The default is `/home/femis/data/met/tead/fxcommpc.out`.
`-sleep <seconds>`	The interval between groups of blocks of data. When sending data for a tower, if it has been sent already in this group, then wait that many seconds. This simulates the Handar Met Collection System sending data for a tower every 15 minutes. The default is `900 seconds (15 minutes)`.

`-ip`	`<IP Address>`	The IP address of the FEMIS onpost UNIX computer. The default is `130.20.28.43`.
`-port`	`<port>`	The port to which the data will be sent for the `fxcommd` program to read. You should use whatever is specified for `fxcommd` in `/etc/services`. The default is `9037`.

7.6.5 fxcomdrv.sh Driver Script - fxcomdrv

The `fxcomdrv` program can be run from the driver script, `/home/femis/bin/fxcomdrv.sh`, which attempts to pass the correct command line options to `fxcomdrv`. You may need to edit the file and set the options you wish to normally use, especially `-file`, `-sleep`, `-ip`, and `-port`.

Note: You can specify the `-sleep` option from the command line. Normally, `fxcomdrv` runs in an infinite loop, sending all the data in the `fxcommpc.out` file, and then starting over from the beginning. If you specify anything for the second command line option, then `fxcomdrv` will only run through the data file once.

To use the driver script, login as femis and type `fxcomdrv.sh`. If you want to sleep 5 seconds between groups of data and only run through the file once, type `fxcomdrv.sh 5 1`.

7.6.6 Troubleshooting - fxcomdrv

The two major classes `fxcomdrv` problems are

1. Problems setting up the socket communications
2. Missing or invalid input data file.

7.6.6.1 Invalid Command Line Option

```
* * * ERR:  Invalid option:  s
```

You specified an invalid command line option. Use the `-help` option to see what options you can use.

7.6.6.2 Trouble Connecting to Socket

```
* * * ERR:  Setting IP address
```

OR

```
* * * ERR:  Setting socket
```

OR

```
* * * ERR:  Connecting to socket
```

You may have specified an invalid IP address or an invalid port number. If they are correct, then the FEMIS UNIX Met daemon may not be installed properly. In other words, the *inetd* daemon may not be listening on the port.

7.6.6.3 Trouble Opening or Reading Data File

```
* * * ERR:  Opening data file
```

OR

```
* * * ERR:  Reading data file
```

The most probable cause is that the input data file does not exist or is empty.

7.7 Operation

The FEMIS Met application suite has three possible configurations.

- The Handar Met Collection System can be providing real Met data.
- The FEMIS PC Met simulator can be providing captured Met data.
- The FEMIS UNIX Met simulator can be providing captured Met data.

One or more of these configurations can be running at one time, but for simplicity, they are discussed separately in the following sections.

Note: In the near term, EMIS will be providing all of the real meteorological (Met) data to FEMIS, which does not involve the FEMIS Met application suite.

7.7.1 Operation - Handar Met Collection System

If the Handar Met Collection System is providing real meteorological (Met) data to FEMIS, then the following components of the FEMIS Met application suite are required:

Software:

- FEMIS PC Met server
- FEMIS UNIX Met daemon
- FEMIS UNIX Met loader.

Hardware:

- FEMIS Met server PC
- FEMIS onpost UNIX computer.

The Handar Met Collection System will send meteorological (Met) data over a serial line to a COM port on the FEMIS Met server PC, where the FEMIS PC Met server program will be

running. It will detect the data on the port and send it to the FEMIS onpost UNIX computer, where the *inetd* daemon will detect data on the socket, start the FEMIS UNIX Met daemon program, and send it the data. It will create a data file with one tower's worth of data and then call the FEMIS UNIX Met loader program. It will load the data into the FEMIS onpost Oracle database. It will replicate the data to the FEMIS offpost Oracle database(s).

Notice that once you start the FEMIS PC Met server program, this entire process requires no human intervention. It is automatic.

7.7.2 Operation - FEMIS PC Met Simulator

If the FEMIS PC Met simulator is providing captured meteorological (Met) data to FEMIS, then the following components of the FEMIS Met application suite are required:

Software:

- FEMIS PC Met simulator
- FEMIS PC Met server
- FEMIS UNIX Met daemon
- FEMIS UNIX Met loader.

Hardware:

- FEMIS Met simulator PC
- FEMIS Met server PC
- FEMIS onpost UNIX computer.

You will run the FEMIS PC Met simulator on the FEMIS Met simulator PC, which will send meteorological (Met) data over a serial line to a COM port on the FEMIS Met server PC, where the FEMIS PC Met server program will be running. It will detect the data on the port and send it to the FEMIS onpost UNIX computer, where the *inetd* daemon will detect data on the socket, start the FEMIS UNIX Met daemon program, and send it the data. It will create a data file with one tower's worth of meteorological (Met) data and then call the FEMIS UNIX Met loader program. It will load the data into the FEMIS onpost Oracle database. It will replicate the data to the FEMIS offpost Oracle database(s).

Notice that once you start the FEMIS PC Met server program and then the FEMIS PC Met simulator, this entire process requires no human intervention. It is automatic.

7.7.3 Operation - FEMIS UNIX Met Simulator

If the FEMIS UNIX Met simulator is providing captured Met data to FEMIS, then the following components of the FEMIS Met application suite are required:

Software:

- FEMIS UNIX Met simulator
- FEMIS UNIX Met daemon
- FEMIS UNIX Met loader.

Hardware:

- FEMIS onpost UNIX computer.

You will run the FEMIS UNIX Met simulator on the FEMIS onpost UNIX computer, which will send the meteorological (Met) data to the socket on the same computer. The *inetd* daemon will detect data on the socket, start the FEMIS UNIX Met daemon program, and send it the data. It will create a data file with one tower's worth of meteorological (Met) data and then call the FEMIS UNIX Met loader program. It will load the data into the FEMIS onpost Oracle database. It will replicate the data to the FEMIS offpost Oracle database(s).

Notice that once you start the FEMIS UNIX Met simulator program, this entire process requires no human intervention. It is automatic.

7.8 Setting Up for Exercise Data

It is possible to setup the FEMIS Met system so that incoming data will be treated as real or exercise meteorological (Met) data. If you want only one or the other, not both, it is a simple matter of changing the `fcmetld.cfg` file and specifying the exercise number you wish to use. Remember that exercise number `0` is real data.

On the other hand, if you want to load both types of data at once, real data from the Handar Met Collection System and exercise data from the FEMIS PC Met simulator, then you need two Met setups on the FEMIS onpost UNIX computer. For example, assume you will use the normal setup to load the real data. Then you need to do the following to load exercise meteorological (Met) data.

1. Create the Met exercise directory tree (for example)

   ```
   /home/femis/logx
   ```

2. Setup the configuration files (for example)

   ```
   /home/femis/etc/fxcommdx.cfg
       point to /home/femis/logx and fcmetldx.cfg
   /home/femis/etc/fcmetldx.cfg
       point to /home/femis/logx
   ```

3. Setup the `/etc` configuration files, adding another entry for the second daemon on port `9038`. Remember to restart the *inetd* daemon.

```
/etc/services
    use port 9038
/etc/inetd.conf
    specify the -i /home/femis/bin/fxcommdx.cfg option
```

4. Setup and run a FEMIS Met simulator, using port 9038.

8.0 FEMIS Data Exchange Interface (DEI)

The FEMIS/EMIS Data Exchange Interface (DEI) system is used to support the transfer of data from EMIS to FEMIS.

8.1 Overview

The FEMIS/EMIS Data Exchange Interface system consists of one main program (`femisdei`) for processing data sent from EMIS and a utility program (`fprofdei`) for maintaining the encrypted password file for File Transfer Protocol (FTP). Both programs run on the FEMIS onpost UNIX computer, the former usually as a background process.

From the EMIS perspective, IBS and FEMIS are essentially indistinguishable. The files are sent from EMIS via FTP to an Internet Protocol (IP) address and some files come back from them in a particular directory. At most, two changes need to be made to EMIS, both on the UNIX computer.

1. The `setup.ini` file may need to be changed to specify the EMIS UNIX user account for incoming files (and the account created if it does not exist). The recommendation, however, is to continue using the current account used for communicating with IBS.

2. The `template` file in the EMIS UNIX user's home directory needs to be changed to point to the new IP address, FEMIS UNIX user account, and password.

EMIS will then communicate with FEMIS instead of IBS.

8.1.1 Software Components

- FEMIS/EMIS Data Exchange Interface program - `femisdei`
- FEMIS/EMIS FTP Profile Manager - `fprofdei`

8.1.2 Hardware Components

- FEMIS onpost UNIX computer
- EMIS computers (PC and UNIX).

8.2 Program Detail - femisdei

The `femisdei` program processes files received from EMIS in a manner similar to the EVENT program in IBS. It is a PRO*C program which connects to an Oracle database and loads data into various tables. The program has three distinct phases of operation: startup, processing loop, and shutdown.

8.2.1 Startup Phase

During the startup phase, the program sets some default configuration items, processes the configuration file and overrides the default setup, and then processes the command line options which override all previous settings. If everything is OK so far, it connects to the Oracle database. If able to connect, it then checks to see if the specified FEMIS exercise exists. If not, the program displays a warning message and continues. Then, if you want it to run as a background process (the `-clone` command line option or the `CLONE` configuration file option) like normal, it moves itself into background.

8.2.2 Processing Loop Phase

Next, the program begins the processing loop, where it waits for a transfer list file, `xferlist.dat`, to appear in the `/home/femx` directory. When the file appears, it reads the header and determines whether the accompanying files are real or exercise data. It then reads and processes the entries one file at a time. Next, it sends the notifications of new data to the FEMIS Notification server via the `fev` client. Then it moves the EMIS files to the "from" directory and sends a `KEY.DAT` file back to EMIS using FTP acknowledging receipt of the files. Then it waits for another transfer list file.

Generically, processing a data file consists of:

1. Reading the file header
2. Adding an entry to the FEMIS journal that the file was received from EMIS
3. Reading the data in the file
4. Converting the data into FEMIS terms
5. Putting the results into the Oracle tables
6. Adding entries to the FEMIS journal that the file was successfully processed
7. Adding entries to the notification list
8. Adding an entry to the acknowledgment key list
9. Sending the acknowledgment back to EMIS.

EMIS can send many types of files, but `femisdei` only loads the data in a few of them. These are: `NOTIFY.DAT`, `D2INPnnn.DAT`, `WORKPLAN.DAT`, and `WEATHER.DAT`. A `KEY.DAT` file with a Please Echo key or a PAR key will also be processed properly. All files from EMIS will be acknowledged, though the files that `femisdei` ignores will always be said to be OK (`DATA_OK`). The other files may or may not be OK based on the contents of each file.

NOTIFY.DAT: If the transfer includes a Notification file, `femisdei` processes it first. It reads the entire file and then determines whether this is a new event, an update to an existing event, or closes one or all EMIS events.

To determine if one or more EMIS events are to be closed, the `END EVENT` Classification is used to close the specified event, and `END ALL OPER EVENTS` or `END ALL EXER EVENTS` is used to close all EMIS events. If only closing a single event, then the event in FEMIS with same EMIS Event ID is ended. Otherwise all EMIS events in FEMIS in the proper mode (operations or exercise #n) are ended.

The new versus update notification is determined by looking at the EMIS Event ID and the Notification Reason field. If there is an event in FEMIS with the same EMIS Event ID, then this is an update. Otherwise, it is a new event. Then get the current operational D2PC case from the Local Config table. Next, add a record for the event to the CSEPP Accident table. Then, if it is a update notification, change the CAI Status Code flag for all previous records for that event, leaving just the new record as the "current" one.

D2INPnnn.DAT: After processing the notification file, `femisdei` processes the D2PC input file, if sent. First, it calculates the D2PC case number by extracting it from the name of the file (the `nnn`). Then it renumbers or deletes any D2PC cases in the database which have the same D2PC case number. (The first available number greater than 1000 is used). If the FEMIS work plan points to an old D2PC case with that number, the program makes it point to the new D2PC case. Then it adds an empty record in the database for the new D2PC case. Next, it processes the file, loading the values into the various D2PC tables. If the D2PC case is a real one (not Reference or What-If), then it updates the Local Config table to point to the new D2PC case. (In other words, the D2PC case sent from EMIS becomes the current operational onpost case in FEMIS.) Next it copies the "Operations" record in the Local Config table to the "OperOnpost" record. Then it updates the `Sendoffpost` flag in the Val List table, which has something to do with notification. Finally, it adds an entry to the Case Management table for the new D2PC case.

WORKPLAN.DAT: For the first activity in the work plan file, the program removes the existing work plan from the FEMIS database. Then for each activity in the `WORKPLAN.DAT` file, it reads the data from the file. The program determines whether this is a completely new activity, or whether it is similar to an activity in the Work Plan Activity table, which is a library of activities. If it is a new activity, a new entry will be added to the Work Plan Activity table, and a new entry MAY be added to the Potential Accident table, which contains a list of all Local IDs. Local IDs are based on D2PC source term information, but the `WORKPLAN.DAT` file only specifies agent and munition. If no Local ID exists with the specified agent and munition, then a new Local ID will be created. Next, it adds a record to the Work Plan Act table, which contains the activities for the current work plan. A number of the fields will be missing information, because it is not supplied by EMIS. When done processing the file, it copies the work plan records in the database from ID 2 to ID 1. Then it updates the `Sendoffpost` flag in the Val List table, which has something to do with notification.

WEATHER.DAT: For each entry in the Weather file, it reads the record, finds the tower name associated with that tower ID, makes all "current" meteorological records for that tower not current, and adds the new record, making it current.

> **Note:** The current date/time is used, not the date/time the reading was taken, since the latter is not really supplied by EMIS.

8.2.3 Shutdown Phase

The final phase, shutdown, usually will not occur. In fact, it can only occur if you run `femisdei` in One Pass mode, if you 'kill" it with the kill file, `femisdei.kil`, if Oracle goes down, or if `femisdei` crashes. The kill file causes `femisdei` to shutdown nicely, committing all outstanding database updates and disconnecting from Oracle. While you can use the UNIX `kill -9` command, it simply stops `femisdei` dead in its tracks and does not force database commits or the database disconnect to occur--two things could happen that you do not want to happen. First, not all the data from EMIS will be saved in the Oracle database. Second, the Oracle connection MAY not immediately go away. This could prevent `femisdei` or other programs which access Oracle from getting a connection. Therefore, to stop the `femisdeI` program, always use the `femisdei -kill` option.

8.3 Program Detail - fprofdei

The `fprofdei c` program is used to maintain the FTP profile file. This file is usually named `/home/femis/etc/femisdei.prf`. It contains the hostname, username, and encrypted password for the EMIS UNIX computer to which `femisdei` will send acknowledgment files via FTP. It is analogous to the `template` file which EMIS uses to transfer files to IBS or FEMIS.

8.3.1 Installation- femisdei, fprofdei

The UNIX programs and support files are in the indicated locations, which is where they are placed when loaded from tape. You should not have to do anything else with them.

```
/home/femis/bin/femisdei
/home/femis/bin/fprofdei
/home/femis/etc/femisdei.cfg
/home/femis/etc/femisdei.prf
```

8.4 Configuring the Programs

The FEMIS UNIX Installation scripts configure DEI automatically, you should not need to do anything. However, if you do need to configure the programs, the following procedures detail the configuration procedures for the `femisdei` and `fprofdei` programs.

8.4.1 Configuration - femisdei

The `femisdei` program requires the following directory structure:

`/home/femis/bin`	- directory for executables
`/home/femis/etc`	- configuration files
`/home/femis/log`	- log files
`/home/femx`	- incoming files from EMIS
`/home/femx/dei/send`	- outgoing files to EMIS
`/home/femx/dei/from`	- saved files from EMIS

Note: ALL of the above directories are configurable, but this is the recommended setup.

8.4.1.1 femisdei UNIX User Account

`femisdei` requires a UNIX user account for receiving files from EMIS. The recommended setup is:

1. Username is `femx`

2. Home directory is `/home/femx`

3. Directory structure is as follows:

```
/home/femx/
/home/femx/dei/from
/home/femx/dei/send
```

4. The `femisdei` program must be able to read and write to all of the directories.

8.4.1.2 femisdei FTP Profile File

The `femisdei` program requires a FTP profile file, usually named `/home/femis/etc/femisdei.prf`. It is maintained with the `fprofdei` utility, to which you should refer for more information.

8.4.1.3 femisdei Configuration File

The `femisdei` program requires a configuration file, usually named `/home/femis/etc/femisdei.cfg`. This file is automatically configured during installation, but you may need to change it later. Comments lines (blank or beginning with #) are ignored. Refer to the sample configuration file in Table 8-1 at the end of this section.

`PATH` (recommend `/home/femis/bin:/usr/bin`): `$ORACLE_HOME/bin`
UNIX PATH environment variable. Should actually be set correctly before `femisdei` starts. This variable may not work correctly.

`ORACLE_SID`
UNIX Oracle environment variable. This variable should actually be set correctly before `femisdei` starts. This variable may not work correctly.

`ORACLE_HOME`
UNIX Oracle environment variable. Should actually be set correctly before `femisdei` starts. This variable may not work correctly.

`ORACLE_BASE`
UNIX Oracle environment variable. Should actually be set correctly before `femisdei` starts. This variable may not work correctly.

`ORACLE_USER`
Oracle username/password. It should be the same as the FEMIS onpost database as specified in the EOC table.

Note: The password is not encrypted. It can be overridden with the `-ora <user/pass>` command line option.

`DEIPATH` (recommend `/home/femx/dei/`)
Top-level directory under which the from and send directories must be located where `femisdei` puts files from EMIS or files it sends to EMIS. Make sure to include the / at the end. It can be overridden with the `-dei <path>` command line option.

`EMISPATH` (recommend `/home/femx/`)
Home directory of the `femx` user, and directory where EMIS put its files. Make sure to include the slash (/) at the end. It can be overridden with the `-ep <path>` command line option.

`PROFILEFILE` (recommend `/home/femis/etc/femisdei.prf`)
Name of the FTP profile file which contains the hostname, username, and encrypted password of the EMIS account to which `femisdei` will FTP files. It can be overridden with the `-pf <fn>` command line option.

`HALTFILE` (recommend `/home/femis/log/femisdei.hlt`)
Name of the halt file which will cause `femisdei` to halt. When the file disappears, `femisdei` will continue processing. This is also the file that gets created with the `femisdei -halt` command.

Note: If the file exists when `femisdei` starts, it will halt.

`KILLFILE` (recommend `/home/femis/log/femisdei.kil`)
Name of the kill file which will cause `femisdei` to exit gracefully. This is also the file that gets created with the `femisdei -kill` command.

Note: If the file exists when `femisdei` starts, it will immediately exit, deleting this file.

`LOGFILE` (recommend `/home/femis/log/femisdei.log`)
Name of the output log file. It can be overridden with the `-log <fn>` or `-nolog` command line options.

FEVHOST, FEVPORT
Name of the FEMIS UNIX onpost computer and port number for use by the fev client for sending notifications of new data to the FEMIS Visual Basic applications. It can be overridden with the -fev <host> <port> command line option.

FTPHOST, FTPUSER, FTPPATH (recommend ./)
Name of the EMIS UNIX computer, username, and path where femisdei will FTP files. It can be overridden with the -ftp <host> <user> <path> command line option.

EXERCISE
Exercise number into which exercise data from EMIS will be loaded. The exercise number does not necessarily have to be a valid exercise in FEMIS -- the data will be loaded anyway. It can be overridden with the -exercise <n> command line option.

SLEEP (recommend 1)
The time interval that femisdei waits between checking for the xferlist.dat file from EMIS. It should not be more than 10 seconds. It can be overridden with the -sleep <seconds> command line option.

DEBUG (recommend NODEBUG)
The debug mode, which controls the detail of messages from femisdei. After you get femisdei running properly, you should run in nodebug mode, which just lists the name of each file from EMIS as it gets processed. Debug level 0 gives slightly more detailed messages, and debug level 2 gives very detailed messages, which would be useless to anyone but the developer. It can be overridden with the -debug, -debug 1, -debug 2, and -nodebug command line options.

CLONE (recommend CLONE)
Controls whether femisdei runs as a foreground or background process. For testing purposes, you may want to run it in foreground, but that means when you want to logout, the process will have to be killed. Normally, femisdei should be run as a background process. It can be overridden with the -clone and -noclone command line options.

CLEAN (recommend CLEAN)
Controls whether temporary files and files are deleted or left around. Both fev.csh and ftp.csh are temporary files created and executed from the /home/femx/dei/send directory. ftp.csh contains the password for the EMIS account, so the file should be deleted. That means that during normal operations, femisdei should clean temporary files. It can be overridden with the -clean and -noclean command line options.

SAVEEMIS (recommend NOSAVEEMIS)
Controls whether files from EMIS are saved by renaming them to include a time stamp, or whether they are simply deleted. It can be overridden with the -saveemis and -nosaveemis command line options. If there is a problem with the EMIS to FEMIS interface, then you should turn this option on. Otherwise, turn it off and run DEI with the -purge option to clean out the directory.

If you run DEI with the SAVEEMIS option turned on, then the from directory will actually include the date as part of its name, e.g., /home/femx/dei/from-1996-10-31. The

send directory will be the same way. All files received from and sent to EMIS will be saved. However, the NOSAVEEMIS option saves just the last set of files from/to EMIS and does not include the date as part of the directory names. If you run DEI with the SAVEEMIS option, you should occasionally delete the old `from` and `send` directories or they will fill up the list.

DOTZ (recommend DOTZ)
Controls whether dates are converted from local time to GMT. It can be overridden with the `-dotz` or `-nodotz` command line options. There is no reason you should ever need to use the `-nodotz` option. It is only used for testing purposes.

KEEPD2 (recommend KEEPD2)
Controls whether D2PC cases from EMIS which have the same number as the new case are saved (renumbered) or deleted. It can be overridden with the `-keepd2` or `-nokeepd2` command line options. If you want to keep every case that EMIS sends, then use the `-keepd2` option, bearing in mind that it will eventually fill up the database.

EMISSITE (recommend NOEMISSITE)
Controls whether EMIS site codes are converted to FEMIS site codes. It can be overridden with the `-emissite` and `-noemissite` command line options. For the current version of FEMIS, you should use the `-noemissite` option, or else some of the notification services will not work properly. If you use the `-emissite` option, the conversions are as follows:

EMIS Site Code	FEMIS Site Code
TOCA	TEAD
ANCA	ANAD
UMCA	UMDA
PUCA	PUDA
ECA	APG
NECA	NAAP
PBCA	PBA
BGCA	BGAD

NEWLOG (recommend NEWLOG)
Controls whether log messages are written to a new log file (see LOGFILE) or appended to an existing one when you restart `femisdei`. It can be overridden with the `-newlog` or `-nonewlog` command line options.

8.4.2 Configuration - fprofdei

The `fprofdei` program requires no configuration.

8.5 Operation

The operating instructions for the `femisdei` and `fprofdei` programs are discussed in the follow sections.

8.5.1 Operation - femisdei

First, a configuration file is required. If you do not specify one, the default is `./femisdei.cfg`. If it does not exist, `/home/femis/etc/femisdei.cfg` is used. If that file does not exist, `femisdei` will not run. A properly setup configuration file means that `femisdei` can be run as follows:

```
% femisdei
```

However, even if the configuration file exists, `femisdei` may not run. When testing, you can override most of its settings with command line options. See Table 8-2, at the end of this section, for a list of `femisdei` command line options.

Note: `femisdei` is normally started automatically when the system boots from `/etc/init.d/femis`.

8.5.2 Operation - fprofdei

The first step when running `fprofdei` is deciding where you are going to put the FTP profile file. If you do not specify the name of the file on the command line, it will create/modify the `femisdei.prf` file in your current directory. However, the recommended location is `/home/femis/etc/femisdei.prf`. If you put it elsewhere, you must modify the DEI configuration file, `/home/femis/etc/femisdei.cfg`.

Next, you need to know the hostname, username, and password of the EMIS UNIX account to which `femisdei` will FTP files to. You can use the same account as used by IBS, which is specified in the file `IEMIS$SYSF:POST_SYSTEM.DAT` on the county VAX. The password in that file is not encrypted.

You are now ready to run `fprofdei`.

Note: `fprofdei` is automatically run during the FEMIS installation process by the FEMIS UNIX Installation script, which creates the appropriate `.pr` file.

Syntax : `fprofdei [-f <profilefile>] <hostname> <username> [<password>]`

Where: `<profilefile>` = name of the profile file. If not specified, the default is `./femisdei.prf`. The recommended name: `/home/femis/etc/femisdei.prf`.

Where: `<hostname>` = name of the EMIS UNIX computer

Where: <username> = username of the account on the EMIS UNIX computer

Where: <password> = password of the account on the EMIS UNIX computer. If you do not specify it, you will be prompted.

Example:

```
fprofdei -f /home/femis/etc/femisdei.prf tadsun1 ibsxfer ibsx
```

The specified host, user, and password (encrypted) will be placed in the FTP profile file. If you run `fprofdei` more than once for the same host and user, it will replace the earlier entry with the new one.

While the FTP profile file can have multiple entries, the `femisdei` program only uses the one entry which corresponds to the EMIS host from which it receive files. It determines the EMIS host by extracting the name from the header of the transfer list file, `xferlist.dat`, which accompanies all files from EMIS.

8.6 Troubleshooting

The troubleshooting instructions for the `femisdei` and `fprofdei` programs are discussed in the following sections.

8.6.1 Troubleshooting - femisdei

For `femidei`, make sure

1. femis account is correct
2. `femx` account is correct
3. Oracle is accessible.

8.6.2 Troubleshooting - fprofdei

Problem: Does not add entry to the recommended FTP profile file, `/home/femis/etc/femisdei.prf`.

If you used the `-f` option, you probably did not specify the correct file name.

If you did not use the `-f` option, then you were probably not in the `/home/femis/etc` directory when you ran the program.

Table 8-1. Sample femisdei.cfg File

```
PATH            /home/femis/bin:/usr/bin:/apps/oracle/product/7.3.2/bin
ORACLE_SID      fi6
ORACLE_HOME     /apps/oracle/product/7.3.2
ORACLE_BASE     /apps/oracle
ORACLE_USER     tead/tead
DEIPATH         /home/femx/dei/
EMISPATH        /home/femx/
PROFILEFILE     /home/femis/etc/femisdei.prf
HALTFILE        /home/femis/etc/femisdei.hlt
KILLFILE        /home/femis/etc/femisdei.kil
LOGFILE         /home/femis/log/femisdei.log
FEVHOST         virus
FEVPORT         9021
FTPHOST         calamity
FTPUSER         femx
FTPPATH         ./
EXERCISE        1
SLEEP           1
NODEBUG
CLONE
CLEAN
SAVEEMIS
DOTZ
KEEPD2
NOEMISSITE
NEWLOG
```

Table 8-2. femisdei Command Line Options

```
Use: femisdei <options>...
 -i           <config file>          : configuration file name
 -0                                  : zero pass (just show settings)
 -v                                  : show version of FEMISDEI
 -V                                  : show RCS version of FEMISDEI
 -help                               : show help messages
 -halt                               : halt other version of femisdei
 -kill                               : kill other version of femisdei
 -purge                              : delete saved files from/to EMIS
 -[no]keepd2                         : keep vs delete existing D2PC cases [keep D2]
 -[no]dotz                           : convert times to GMT [convert to GMT]
 -[no]onepass                        : one pass (process one file) [multi-pass]
 -[no]clone                          : clone a background process [do not clone]
 -[no]clean                          : cleanup temporary files [do not cleanup]
 -[no]saveemis                       : save EMIS files [do not save]
 -[no]emissite                       : use EMIS site codes [do not]
 -[no]newlog                         : create new log [append to log]
 -[no]log     <log file>             : name of log file [no log file (screen)]
 -[no]debug   <level>                : debug level (0,1,2) [no debug]
 -sleep       <seconds>              : number of seconds to sleep
 -exercise    <number>               : exercise number
 -ep          <emis path>            : directory for incoming EMIS files
 -pf          <profile file>         : profile file name
 -fev         <host> <port>          : fev host port
 -ftp         <host> <user> <path>   : ftp host username path
 -dei         <dei path>             : top-level directory for DEI output files
 -ora         <user/pass>            : Oracle username and password
```

9.0 FEMIS GIS Database

The FEMIS spatial data resides both on the UNIX server and on each PC that is running FEMIS. The master copy of the spatial database resides on the server and contains the static GIS themes (layers), the FEMIS ArcView project file (`FEMISGIS.APR`), the GIS initialization file (`FEMISGIS.INI`), two map symbol files (`MARKERDF.AVP` and `OBJ_TYPE.LUT`), and an initial version of the dynamic GIS themes. When FEMIS is first installed on each PC, the spatial database files for the relevant hazard site are copied from the server to the `\FEMIS\GIS` directory and associated subdirectories on the PC. During subsequent FEMIS version upgrades, selected spatial data files may be copied to a PC as necessary to apply changes or additions to the spatial data.

The following paragraphs discuss the components of the spatial database and the methods used to maintain, configure, customize, backup, and troubleshoot the spatial database.

9.1 Spatial Data Description

The FEMIS spatial database is made up of a number of themes or layers. Each theme contains data (location information and descriptive attributes) representing a collection of geographic objects of a particular type (e.g., roads, political boundaries, meteorological towers, emergency protection zones). The spatial database also contains a customized ArcView project file, an initialization file that tells ArcView what themes are to be loaded into the project file and how to display them, and an optional legend file associated with each theme that provides additional information on how to display the theme's data on the map. For detailed descriptions of the individual FEMIS spatial data themes, please refer to Section 3.3, Building Spatial Data, in the ***FEMIS Data Management Guide***.

9.2 Spatial Data Maintenance

The static spatial data themes are built from various data sources. These themes normally change quite infrequently, and such changes are made either by regenerating the entire theme from new or updated data sources, or by making minor editing changes in the existing theme data. For detailed information on how to maintain or upgrade the static data themes, please refer to Section 5.0, Managing Spatial Data, in the ***FEMIS Data Management Guide***.

As FEMIS is being run, the data in the relational database that corresponds to the dynamic spatial data themes (e.g., facilities) may occasionally be altered through the addition, modification, and deletion of information by users that have the appropriate FEMIS privileges. As necessary during its operation, FEMIS automatically regenerates the spatial data files for

these dynamic themes on each PC based on the data in the relational database. No additional action by the system or data administrator is necessary to maintain these themes under normal circumstances.

9.3 GIS Configuration

When you install FEMIS and select the full installation option or check the GIS option on an upgrade installation, the complete GIS directory structure and all of its spatial data files will be copied from the server to the `\FEMIS\GIS` directory on your PC. If you do not select the GIS option on an upgrade installation, only the files that are known to have changed from the previously installed FEMIS version (typically the `FEMISGIS.APR` and `FEMISGIS.INI` files) will be copied to your PC.

The `\FEMIS\GIS` directory contains a number of subdirectories, and each subdirectory contains the spatial data files for a specific theme. Also in the `\FEMIS\GIS` directory are two files that determine the configuration of the spatial database: `FEMISGIS.APR`, the ArcView project file; and `FEMISGIS.INI`, the GIS initialization file. A special subdirectory, `\FEMIS\GIS\APR`, may contain several alternate `INI` files. The alternate `INI` files together with the unloaded `APR` file can be used to regenerate the `FEMISGIS.APR` file under several different configurations. For example, some users may wish to install all of the raster maps for a site, while other users may have limited disk storage space and may only be able to install a subset of the raster map files.

Another special subdirectory, `\FEMIS\GIS\LOOKUP`, contains two symbol files (`MARKERDF.AVP` and `OBJ_TYPE.LUT`) which include information used to generate the theme classification legends. These legends are used to display different map symbols or icons based on the value of a designated attribute within a GIS layer. For example, facilities can be symbolized based on a facility type, such as a school or hospital.

9.3.1 Symbol Lookup Table

The symbol lookup table is located in the `c:\FEMIS\GIS\LOOKUP` directory under the file name `OBJ_TYPE.LUT`. The lookup table specifies the symbols to be used to create the theme legends.

Each line consists of five entries separated by vertical bars as delimiters. The first three entries are numbers corresponding to a symbol type, color, and size. These numbers reference symbol attributes from within the active symbol palettes in ArcView. The fourth entry specifies the theme type and the last entry specifies the theme subtype. The symbol type and color numbers designate the order in which the symbols are listed in the FEMIS GIS pallet window using `0` for the first element. The symbol size is measured in "points" (1/72 of an inch).

An example of the lookup table is listed below. From the facility entries, we can see that school facilities are symbolized with the 89th symbol, colored with the 46th color, and measure 12/72 of an inch.

```
  1|  2 |  1 | abpc     | Categ i
...
  7| 16 |  2 | zone     | IRZ
...
 31|  2 |  1 | road     | A31
 33|  2 |  1 | road     | A33
...
 12| 12 | 10 | tcp      | Traffic
...
 25|  8 | 10 | siren    | rotating
...
109| 55 | 10 | facility | refinery
 18| 57 | 12 | facility | retirement home
 89| 46 | 12 | facility | school
 27| 34 | 10 | facility | shelter
...
 29|  9 |  9 | igloo    | NONE
...
```

9.3.2 Symbol Defaults

The `MARKERDF.AVP` file contains the symbols loaded in the default FEMIS symbol palette. You may change these symbols using the generic ArcView palette window functionality. You may use any of the other symbols provided by ArcView in the `C:\ESRI\AV_GIS30\ARCVIEW\SYMBOLS` directory. You may also import symbols from ArcInfo or icons in raster format. If you delete or change the sequence of the existing symbols, then some of the FEMIS GIS "look and feel" will change. For example, if you change the 42nd symbol from a cross hair to an asterisk, then the object (e.g., facility) locations in the FEMIS GIS will be depicted with an asterisk instead of the familiar cross hair. You may add new symbols at the end of the palette and use the symbol lookup table (Section 9.3.1) to refer to the new symbols.

9.4 Customizing the FEMIS Map

You can customize the content and appearance of the FEMIS map by editing the original `FEMISGIS.INI` file or any of the alternate `INI` files to create a custom `FEMISGIS.INI` file which can then be used to create a custom `APR`. You can add new themes; delete existing themes; change the minimum or maximum scale display thresholds; modify the type, color and size of line or point map features; change the legend names; designate the label (and if applicable, classification fields); specify the default classification fields; designate an alternative directory (and if needed, an alternate drive) for the data source of non-event themes; and control which themes are visible by default when the GIS is first started. A detailed description of the fields in the `FEMISGIS.INI` file are in Section 9.4.1, Customizing the FEMISGIS.INI File. An example file is located at the end of this section.. You can also import your own symbols from other ArcView, ArcInfo, or raster icons by changing the symbol lookup table and the FEMIS default palette as described in Section 9.3.1, Symbol Lookup Table.

9.4.1 Customizing the FEMISGIS.INI File

The `FEMISGIS.INI` file contains data required to initialize GIS parameters that generate the `FEMISGIS.APR` and to ensure the proper GIS contents each time the FEMIS GIS is invoked by the FEMIS application. An example of the `FEMISGIS.INI` file is shown below. The contents of the `FEMISGIS.INI` file are as follows:

Part A of the table specifies the UTM (Universal Transverse Mercator) projection parameters required for each installation. The parameters shown are for Zone 12 (used in Utah). To obtain a better fit of the themes and the background image map, the scale factor set to 0.99953 instead of the usual 0.9996.

Part B of the table specifies a geographic area of interest, which is a rectangle that starts at the origin (lower left corner) of -114.00 degrees longitude and 37.00 degrees latitude and spans 5.5 degrees longitude (first size parameter) and 5.5 degrees latitude (second size parameter). The area of interest is specified to minimize the consequences of ill-defined data points. In certain occasions, the user is given the opportunity to define the longitude and latitude where an event has occurred. FEMIS GIS does not allow the specification of plumes or threat wedges that originate outside the area of interest.

Part C of the table specifies the themes to be loaded in the FEMIS GIS with a set of parameters as follows:

The data in the `FEMISGIS.INI` table is delimited by vertical bars. No data value should contain a vertical bar. String values do not need to be quoted. Blank lines are ignored. Lines with a single quote in the first column are recognized as comment lines and are ignored.

Each theme line of the input `FEMISGIS.INI` table contains the following theme data in sequence:

0	Theme	Theme name as stored in the FEMIS Database `GIS_LAYER` table (see the value of the flag in the next entry to assess whether the name is required or not). A short mnemonic name otherwise.
1	DB Object	Yes or no flag of whether the theme is in the FEMIS database.
2	Type	Theme feature type; it must be one of: image, point, line, polygon, or event.
3	Status	Theme visibility status when forming or loading the `APR`.
4	Label Field	Field name used as the default labeling field.
5	Obj Category	FEMIS theme category; it must be one of: zone, abpc, facility, tcp, road, igloo. If it is "none", then the theme may not be classified using the lookup tables. In this case, the "Classification Field" should be set to "none" and the "Default Legend" entry should be set to "simple."

6	Classification Field	Field name where the object sub-type is located. The subtypes should be the same as in the lookup table; "none" indicates no classification.
7	Default Legend	Identifies the type of legend to be used when the APR appears on the screen. Enter "simple" for a simple legend to be used, otherwise use the classification in the "Classification Field" entry. The classified legend will be loaded provided it exists, else it will be created and then loaded. If the classification field cannot be found, a simple legend will be generated.
8	Min Scale	The scale denominator of the minimum scale below which the theme is not displayed.
9	Max Scale	The scale denominator of the maximum scale above which the theme is not displayed.
10	Legend Name	Name desired for the theme legend.
11	Symbol	Symbol number to be used in a simple legend.
12	Color	Foreground and outline color for theme symbols, if they can be colored.
13	Size	Symbol size in points (1/72 of an inch)
14	Path	Appended to the HOME value specified in the FEMIS.INI file to identify the location of the GIS data.
15	Alternate path	Used as the absolute path to identify alternate sources of data. It cannot be used for event themes. Any auxiliary files will be written using the HOME prefix and the path specified in the "Path" entry above. The stem of the theme name (the 8 character part in a 8:3 name), which is the last part of this entry, should be identical to the stem of the path in the "Path" entry.

There should be exactly 16 entries in each line. Empty entries ("") are not allowed; use "none" instead.

An example of a FEMISGIS.INI is located at the end of this section.

9.4.2 Altering the Default FEMIS Map

To alter the default appearance of the FEMIS map, do the following:

Step 1 Copy or rename the original \FEMIS\GIS\FEMISGIS.INI file to another name (e.g., FGISORIG.INI) and store it in the \FEMIS\GIS\APR directory so that you can retrieve it and use it later, if necessary. Do the same with the original APR

(e.g., copy and rename it to \FEMIS\GIS\APR\FGISORIG.APR). Then make another copy of the original INI file or of one of the alternate INI files. Edit the copy to

1. Remove or comment out (using a single quote in the first column) lines defining existing themes that you want to exclude.

2. Add lines to define new themes.

3. Modify the appropriate display parameters of existing themes as desired.

4. Copy and rename the edited INI file to \FEMIS\GIS\FEMISGIS.INI.

Step 2 Delete any existing FEMISGIS.APR file. One FEMISGIS.APR file is located in the C:\FEMIS\GIS directory. Run ArcView on the empty project file, C:\FEMIS\GIS\APR\FGISEMPT.APR, by double clicking on the file name in the Windows File Manager. When ArcView has loaded the FGISEMPT.APR file, it will contain the FEMIS themes indicated in the FEMISGIS.INI files and will create the FEMISGIS.APR file in the C:\FEMIS\GIS directory.

Step 3 Examine the theme legends to see that the correct set of themes was loaded and the correct ones are visible. The facilities theme will not appear in the legend. This theme is a dynamic theme that is loaded when the FEMISGIS.APR is used by FEMIS. Then examine each theme to see that it displays correctly (check the checkbox in the legend to make visible the themes that are invisible by default). If some themes are not displayed correctly, recheck the INI file. If necessary, exit ArcView, edit the INI file to make corrections, and then repeat Step 2.

Step 4 Exit ArcView. Use the Window File Manager to set the FEMISGIS.APR file access properties to "read only." The FEMISGIS.INI and FEMISGIS.APR files you just created will be used each time the FEMIS GIS is started.

9.5 Backup Procedures

The installation directory for the spatial data on the UNIX server is /home/femis/gis. This is the current operational GIS data that gets copied to the PCs when FEMIS is installed or upgraded. It is recommended that a tar tape of this directory be made each time a new version of FEMIS is received. The tape should be labeled "FEMIS GIS Data" with the date and FEMIS version number included. If the GIS data on the server should become corrupted or deleted, the spatial data can be restored from the backup tar tape without having to perform a reinstallation of FEMIS on the server.

If a site customization of the spatial data and/or the APR and INI files is to be done, the original GIS data directory should first be copied to another directory (e.g., /home/femis/data/v<x.y>/gis, where <x.y> is the FEMIS version number associated with the released data. A second tar tape of the GIS directory should be made following the completion of the GIS customization.

9.6 Troubleshooting

There are a number of factors that can cause errors in loading or displaying the spatial data themes, or undesirable display behavior or appearance. Some of the more common problems are listed below, along with some suggestions for finding and correcting the problems.

1. "Zoom to All Themes" may cause displayed themes to shrink to a very small portion of the display screen, or to disappear entirely. This is typically caused by themes having one or more objects with "improper" latitude/longitude coordinates, e.g., (0,0) or any point that is far from the "area of interest" surrounding the hazard site. For most of the point themes, you can check the attribute table associated with the theme (activate the theme legend and click the `Table` button in the ArcView button bar). Search the latitude and longitude columns for values that are noticeably different from the majority of objects in the theme. Attempt to verify the correct coordinates for points that are suspected to be outside the area of interest.

2. Error messages similar to "Unable to Access Theme" or "Index Out of Range" may occur when attempting to access the GIS. These errors are most often caused by improperly defined themes, such as an empty theme (a theme with zero map objects). Check the text file (`.evt` file) associated with all event themes to make sure each theme contains at least one data line in addition to the header (column names) line.

3. "Classification" errors may occur when attempting to load theme data into an empty `APR`. They can occur on themes with legends that classify and display the map objects based on a column in the theme's attribute table (e.g., zones are classified and displayed by zone type: Depot, PAZ, IRZ.). The error could be caused by the wrong field name being designated as the classification field in the `FEMISGIS.INI` file. Check the attribute table of the offending theme in the `APR`.

   The error could also be caused by a new data value for the classification column that was not included in the values defined in the theme's legend (`.leg`) file. Regenerate the `FEMISGIS.APR` from the empty `APR` using the process described in Section 9.4, Customizing the FEMIS Map. Make sure that all the entries in the classification field are included in the `\FEMIS\GIS\LOOKUP\FEMISGIS.LUT` file.

4. Display refresh delays may occur during zooming. For example, the GIS may take an inordinate amount of time to refresh the map display when zooming into a very small area of the map. These lengthy delays can usually be attributed to one or more of the larger themes (map images or vector themes with a large amount of data) that does not have an appropriate lower display limit. To check the display limits of a theme, activate the theme legend, then select `Properties` under the `Theme` menu, then click `Display`. The minimum scale should never be less than 10 for themes with a large amount of data, such as roads, streams, census block boundaries, or raster map images. A larger minimum scale (e.g., 100) may help to reduce the zoom-in redisplay time significantly.

5. The appearance of raster map images may be degraded and may detract from the viewing of other themes if displayed at an inappropriate scale factor. Follow the procedure described in Item 4 above to check the display limits of a map image theme and set the limits to appropriate values for the map scale at which the original scanned map was

created. If the image is allowed to be viewed at scales that are too small compared to the map's base scale (e.g., 1:200,000 for a 1:24,000 scale quad sheet map), the image will appear too small to be readable and will clutter the display. If the image is allowed to be viewed at scales that are too large (e.g., 1:1,000 for a 1:24,000 scale map), the individual pixels of the digitized map will be enlarged so much as to give the portion of the map being viewed a "blocky" and unfocused appearance. The "best" scale range will vary depending on the resolution and quality of the scanned image, but a general guideline is that the scale value (denominator of the scale ratio, e.g., 24000 for a scale of 1:24,000) should have its minimum set to about 20 percent of the map's base scale value (e.g., around 5000 for the 1:24,000 example) and its maximum set equal to or slightly larger than the base scale value (e.g., around 30000 for the 1:24,000 example). A greater range may be used if the map image is of very high resolution and quality.

```
'A. UTM projection parameters
Central Meridian:  -87
Reference Latitude:0
False Easting:     500000
False Northing:    0
Scale:             0.99953
'
'B. Area of interest (in decimal degrees)
'
origin:  -88.50|  31.25
size:      9.50|   9.50

'C. Theme parameters
'         DB                Visible Label    Obj Lookup  Class     Default     Min      Max                                                    Alternate
'Theme    Object  Type      Status  Field    Category    Field     Legend      Scale    Scale      Legend Name              Symbol Color Size Path                  prefix

'im_1m    | no    |Image    |off    |None      |None     |None     |None       |500000.0| 1500000.0|Map Image 1:1M          |   0|    0|    0| im_1m\anad1m       | none
im_500k   |yes    |Image    |off    |None      |None     |None     |None       | 90000.0|  500000.0|Map Image 1:500K        |   0|    0|    0| im_500k\anad500k   | none
'im_100k  | no    |Image    |off    |None      |None     |None     |None       | 20000.0|   90000.0|Rome 1:100K             |   0|    0|    0| im_100k\rome100k   | none
'im_100k  | no    |Image    |off    |None      |None     |None     |None       | 20000.0|   90000.0|La Grange 1:100K        |   0|    0|    0| im_100k\lagr100k   | none
'im_100k  | no    |Image    |off    |None      |None     |None     |None       | 20000.0|   90000.0|Guntersville 1:100K     |   0|    0|    0| im_100k\gunt100k   | none
'im_100k  | no    |Image    |off    |None      |None     |None     |None       | 20000.0|   90000.0|Birmingham S. 1:100K    |   0|    0|    0| im_100k\birs100k   | none
'im_100k  | no    |Image    |off    |None      |None     |None     |None       | 20000.0|   90000.0|Birmingham N. 1:100K    |   0|    0|    0| im_100k\birn100k   | none
'im_100k  | no    |Image    |off    |None      |None     |None     |None       | 20000.0|   90000.0|Anniston 1:100K         |   0|    0|    0| im_100k\ann100k    | none

contour   | no    | Line    |off    |Elevation |None     |None     |simple     |  2000.0|  200000.0|Elevation Contours      |   0|   52|    1| contour\anadc300   | none
cedblock  | yes   |Polygon  |off    |Block     |None     |None     |simple     |  2000.0|  150000.0|Census Blocks           |   0|    5|    1| cedblock\anad_tb   | none
place     | no    |Polygon  |off    |City      |None     |None     |simple     | 20000.0|15000000.0|Place Boundaries        |   0|    0|    1| place\anad_pl      | none
abpc      | yes   |Polygon  |off    |Wedgetype |abpc     |Wedgetype|Wedgetype  | 20000.0|15000000.0|Accident Based Plan     |   0|    3|    1| abpc\anad_pc       | none
adminbnd  | no    |Polygon  |off    |Name      |None     |Type     |Type       | 20000.0|15000000.0|Administrative Bound    |   0|    0|    1| adminbnd\anad_ab   | none
zone      | yes   |Polygon  | on    |Zone      |Zone     |Type     |Type       |  5000.0|15000000.0|Emergency Zones         |   0|   16|    2| zone\anad_ez       | none
zone_paz  | no    |Polygon  |off    |Zone      |Zone     |Type     |Type       |  5000.0|15000000.0|Protective Action Zones |   0|    2|    2| zone\anad_paz      | none
zone_irz  | no    |Polygon  |off    |Zone      |Zone     |Type     |Type       |  5000.0|15000000.0|Immediate Response Zones|   0|    7|    2| zone\anad_irz      | none
stcounty  | no    |Polygon  | on    |County    |None     |None     |simple     | 20000.0|15000000.0|County Boundaries       |   0|    5|    2| stcounty\anad_sc   | none
fire_dis  | no    |Polygon  |off    |Name      |None     |None     |simple     | 20000.0|15000000.0|St.Clair Fire Districts |   0|    0|    1| fire_dis\cstc_fd   | none
blockpop  | no    |Point    |off    |Population|None     |None     |simple     |   500.0|  500000.0|Nightime Block Pop.     |   1|    5|    4| blockpop\bl_n_pop  | none
blgrppop  | no    |Point    |off    |Zipcode   |None     |None     |simple     |   500.0|15000000.0|Daytime Block Group Pop.|   2|    5|    4| blgrppop\bg_d_pop  | none
railroad  | no    |Line     |off    |Fname     |None     |None     |simple     |   500.0|20000000.0|Railroads               |   0|   32|    1| railroad\anad_rr   | none

roadall   | no    |Line     |off    |Fname     |None     |None     |simple     |   500.0| 1500000.0|Calhoun Co Roads        |   0|    8|    1| roadall\ccal_ra    | none
roadmaj   | no    |Line     |off    |Fname     |None     |None     |simple     |   500.0|20000000.0|Major Roads             |   0|    8|    1| roadmaj\anad_rm    | none
rta_ctal  | no    |Line     |off    |Route     |None     |None     |simple     |   500.0|20000000.0|Talladega Route Alerts  |   0|    5|    1| rta_ctal\ctal_rta  | none
rta_cstc  | no    |Line     |off    |Route     |None     |None     |simple     |   500.0|20000000.0|St. Clair Route Alerts  |   0|    5|    1| rta_cstc\cstc_rta  | none
highway   | no    |Line     | on    |Street    |None     |None     |simple     |   500.0|20000000.0|Interstates             |   0|    8|    2| highway\anad_hw    | none
exit_nos  | no    |Point    |off    |Exit_numbe|None     |None     |simple     |   500.0|20000000.0|Interstate Exits        |   6|    5|    8| exit_nos\anad_ex   | none
pl_names  | no    |Point    |off    |Name      |None     |None     |simple     |   500.0|  200000.0|Place Names             |   4|   59|    6| pl_names\anad_pn   | none

igloo_p   | yes   |point    | on    |Igloo_Name|igloo    |Content  |Content    |    10.0| 2000000.0|Igloos                  |  14|    8|   10| igloo_p\anad_ip    | none
mettower  | yes   |point    | on    |Objectname|None     |None     |simple     |  1000.0| 2000000.0|Met Towers              |  32|    5|   10| mettower\anad_mt   | none

siren     | yes   |Event    |off    |Objectname|None     |Objecttype|simple    |  1000.0|15000000.0|Sirens                  |  25|   32|   10| siren\siren        | none
tcp       | yes   |Event    |off    |Objectname|tcp      |Objecttype|simple    |  1000.0|15000000.0|Traffic Control Points  |  26|   51|   10| tcp\tcp            | none
facility  | yes   |Event    | on    |Objectname|Facility|Objecttype|Objecttype|  1000.0|15000000.0|Facilities              |   1|   50|    6| facility\facility  | none
```

10.0 FEMIS Oracle Database

The relational database in FEMIS is managed by Oracle v7.3.2, a commercial DBMS. The distributed processing features of Oracle are utilized to produce a multi-server distributed data architecture. Data replication is widely used to provide a local copy of most shared tables. This replication is important because it allows an EOC to operate autonomously in case the links to other EOCs are not operational. Also, performance is enhanced because the local tables are located on the local database.

In FEMIS, over 180 tables comprise the FEMIS relational database. Four logical data models (Main, Spatial, Evacuation, and D2) describe graphically what information is present and how the data objects are interrelated. The Main data model represents a large collection of general purpose tables, the Spatial data model contains tables used by the GIS, the evacuation (Evac) model contains evacuation model tables, and the D2 model contains tables used by the dispersion model. Additional information about the data models is available in the ***FEMIS Data Management Guide.***

Based on design efforts and testing results, each relational database table is local to an EOC or shared with the other EOCs. Data in the local tables can be accessed only from users logged in to that EOC. The data in shared tables is available to several EOCs. Details of data placement are made transparent to the FEMIS users, so the FEMIS database appears to be a single, unified collection of tables. This physical design of the Oracle database is provided as a part of database implementation and should be applicable to all CSEPP sites. More details about the Database Management System (DBMS) are provided in the ***FEMIS Data Management Guide.***

10.1 Data Description

When creating the first database for a new site or when making major database modifications, it is necessary to create the database structure from scripts and load basic data so the FEMIS application can operate. For most situations, the new database will be created in a development facility and then packaged so it can be delivered to the operational site. Section 2.3, Creating the FEMIS Database, describes how a new database is installed at the site.

For cases where the FEMIS software is updated to a new release, the existing site database can be updated, if necessary, to support new capabilities. In this case, one or more scripts are developed to make the data structure and/or data content modifications. Instead of recreating the database, the scripts are run to make it compatible with the new FEMIS version of software.

10.2 Replication

Oracle provides several ways to share data between EOC servers in a distributed, multiserver environment. When the site environment is not tightly controlled by one group, it makes sense to operate in a mode where operations can proceed in each server independent of what the other servers are doing. To make this happen, data sharing has to be asynchronous so that data changes in one server are not dependent on making similar changes in the other servers in the same transaction.

In Oracle v7.3.2, data record changes can be propagated to other servers using read-only snapshots. This method is currently used by FEMIS since it is asynchronous and flexible. The server where the change occurs creates a log of the change and waits for remote servers to request updates. If the remote server is up, it periodically sends a request for these updates. In FEMIS versions before 1.2, requests were made on most tables on a 1 minute rate and on the D2PC tables at a 20 second rate. This method of data sharing works well with four or fewer servers but due to constant polling, develops a load on the servers and on the network.

In FEMIS v1.2, a new method of data sharing became available for multiple servers. This method is an event driven scheme that still is asynchronous but is less demanding on the servers and network. The new design uses change logs as before but signals the remote servers to refresh their snapshots as the change is made. This reduces the polling overhead at the remote sites and the request traffic on the network.

The current method uses a replicated update table that indicates when a group of snapshots needs to be refreshed due to changes in one or more tables in the group. A local periodic Oracle process monitors the local snapshot of this table to determine when to refresh the snapshots in the groups. Only the new update table is refreshed periodically rather than all of the tables. This allows the number of servers per site to increase to allow each EOC to have a dedicated server.

When the database is installed at a site, either a configuration with all EOCs on a single server or a configuration of each EOC on its own server is chosen. In the former case there is no replication since the data is shared by Oracle views. If the multiple server option is used, then scripts delivered with the database are run to create the data sharing objects (see Section 2.3, Creating the FEMIS Database).

Once the distributed objects are created, replication can be initiated by running the scripts provided. Before doing this, establish that the other servers at the site are in a ready state to be able to participate in data sharing. If a local site is going to be down for several hours or more, replication can be stopped at the other servers by running the stop scripts.

10.2.1 Add Facility Type to FEMIS FACILITY_TYPE Table

The `FACILITY_TYPE` table is a CSEPP global database table and is not shared between EOCs. If a new facility type is added to an EOC database, it needs to be added to the FEMIS database at all EOCs at the site.

Identify the "type" of new facility you wish to add to the FEMIS database. For this example, we will add a new facility type called Prison.

Enter the FEMIS application by selecting the `Database Manager` under the `Utility` menu. The privilege need to use the `Database Manager` function is usually only given to the FEMIS System Administrator. It does not matter what mode you are in since updating the `FACILITY_TYPE` table is global across operations and exercises. As such, when a new facility type is added, it will be seen by all of the existing FEMIS functionality across operations and exercise.

From the FEMIS Database Manager window, enable the `Grid (Read Only)` radio button, select the local EOC's `FACILITY_TYPE` table, and click the `Open` button. A non-editable snapshot view should be opened that allows you to examine all of the existing facility types. Make sure that the facility type you want to add does not already exist in the `FACILITY_TYPE` table with a different spelling or a synonym.

Note: Proceed only if you really need to add a new facility type.

Enable the `Form (Editable)` radio button, then re-select the local EOC's `FACILITY_TYPE` table, and re-open it. A window containing an editable dynaset for the `<eoc>.FACILITY_TYPE` will open. Select the `Add` button and enter the new facility type (e.g., Prison). For consistency you should enter the facility type in lower case. Enter the facility type description (e.g.,Prison) into the empty database administration form. When you are done, select the `Update` button. The new facility type is added to the EOC's `FACILITY_TYPE` table. Close the update form.

Review the contents of the table from a grid. Check to see that the new facility type has been added to the database by accessing `Facility` under the `Data` Menu item. Select a facility to enable the `Edit` button, click on the `Edit` button, select a facility, and pull down the Facility Type list. The new facility type should be present.

Note: To ensure that the new facility type is also accessible to the GIS, you need to add the new type to the GIS tables as well.

Edit the FEMIS `OBJECT_SUBTYPE` table to link the new facility type to the GIS.

Select the `Database Manager` under the `Utility` Menu, set the Viewing method to `Grid (Read only)`, select the local EOC's Object Subtype table, `<eoc>.OBJECT_SUBTYPE`, and open the table. Be sure there is no record whose `LOCATION_TYPE` is "facility" and whose `OBJECT_SUBTYPE` and `FEMIS_OBJECT_DESCRIPTION` match the new facility type you just added.

If the new facility type is not in the table, close it and re-open the `OBJECT_SUBTYPE` table using the editable viewing form.

In the form, select the `Add` button to enter the new facility type into the table read by the GIS. Make the following entries:

LOCATION_TYPE:	The text "facility" (must be lower case)
FEMIS_OBJECT_SUBTYPE:	The same facility type you entered in the FACILITY_TYPE table. Be sure they are EXACTLY the same.
OBJ_SUBTYPE_DESCRIPTION:	The same facility type description you entered in the FACILITY_TYPE table. Be sure they are EXACTLY the same.

Use the Update button to commit the new facility type to the OBJECT_SUBTYPE table. This table is used by the GIS to list the types of facilities that can be located by the GIS.

10.2.2 Testing the Addition of a New Facility Type

After the FACILITY_TYPE and FEMIS_OBJECT_SUBTYPE tables have been updated to contain exactly the same facility type and description, they need to be tested to ensure that they are working properly with the FEMIS application.

To test the new facility type entry in the FACILITY_TYPE table, enter the Facility Manager under the Data menu. You may want to be in Exercise Mode to ensure that any new facilities you create can be deleted. Select the Add button to create a new facility using the facility type you have just entered into the FEMIS validation tables. In the General tab:

1. Enter the name of the facility.

2. Select the new facility type from the Type pull-down list. If the new subtype appears, the FACILITY_TYPE table was properly updated.

3. Use the Map button to provide the longitude/latitude for the new facility, either by entering values directly or using the GIS to pick a point.

4. Click OK to get the new facility into the database.

To test the new facility type entry from the GIS, enter the Task Status Board, and click the Edit button. When the Edit Task window appears, click on the Map button on the General tab. The Select Location form appears:

1. Select Facility from the Type pull-down list (All facility types should appear).

2. Select the new facility type you have just added from the SubType pull-down list. You should see the name of the facility you added in the Name list. If the name of the new facility you added appears, everything is proceeding along nicely.

3. Use the Map Object button to pick the facility you added to ensure that the GIS also returns the new facility.

4. If this works properly, the new facility type has been successfully added.

10.2.3 Coordinate the Change to All EOCs

Be sure to have the other EOCs add the new facility to their EOC databases to ensure that the facility information is transferred properly from EOC to EOC. If this is not done, FEMIS will work properly BUT there will be some inconsistencies in the FEMIS database and user interface screens. Facilities replicated with the new facility type will be plotted on the GIS map and will appear in the spreadsheet of the facility management interface (select `Facility` under `Data`). However, if the receiving EOC does not have the new facility type in its FEMIS database, the type will not appear in the Type menu for the EOC. It will be left blank because that facility type does not exist at that local EOC.

If a user selects another EOC's facility that contains a facility type (from the GIS map via the Select Location interface) which is not in the local EOC's Facility Type table, the facility type returned to the Select Location interface will be (All) instead of the proper facility type. Thus, the changing of facility types should be coordinated with other EOCs and should be performed at the same time.

10.3 Backup Procedures

The relational database in FEMIS contains much of the information that is used in all modes of operation. Therefore, the database is a critical part of the system and has to be reliable even when problems occur. To ensure that the database can be recovered in case of hardware, software, or human error, it is backed up on a regular basis. Several options are available in the Oracle database to recover from problems but all rely on proper backups.

The Oracle backup procedure is integrated with the file system backup procedure to make sure the proper data files are copied to tape and saved for sufficient time. The file backup procedures are described in Section 14.2, Backup Procedures for the FEMIS UNIX Server. The Database Administrator should be familiar with file backups and know how to restore files from the backup tapes. The System Administrators have the flexibility to tailor file backups and database backups to their own requirements.

The backup policy is to do a complete backup of the Oracle database once a week and save the files that allow the Database Administrator to restore the database to a point in time, including the last time the database was operating normally. For example, if a disk containing a database file had a media error, the database could be recovered by loading the last full backup of the file and recovering all transactions related to that file up to the time the file was lost. Sometimes it is desirable to restore the database to the way it was several days ago. An example would be when testing creates unwanted data and all effects of the testing need to be removed. In this case, a point in time recovery is necessary.

The Oracle database is backed up during off use times by performing a hot backup that does not require the database to be shutdown. Each datafile is put into backup mode and then copied to a save area. After that, the Oracle control file is copied to the save area. At this point the database is backed up and the files in the save area can be copied to tape as part of the file system backup process. When all files are safely backed up to tape, the online Oracle redo logs are removed so the file space is available for the next set of logs.

Another method of backup is also provided to enable the Database Administrator to restore the database to a previous state. This uses the Oracle export utility tool to make a consistent copy of the database to a file. Exports are done immediately preceding a full backup and during each incremental file system backup. Therefore, five exports are normally done each week. The Oracle import tool is used to regenerate the database in case of major failures.

10.4 Performance Maintenance

The local Database Administrator should observe the output of the `femismon.sh` in the morning and at least several other times during the day as described in Section 4.0, FEMIS Monitoring Tools. Besides the tests done by the FEMIS monitoring tasks, the local Database Administrator should also check daily on the status of Oracle to ensure file usage is normal and backup procedures are operating correctly. Over time, each Database Administrator will develop their own set of activities to perform these tasks.

10.4.1 Check the Alert Log

The Oracle Alert Log is a file maintained by Oracle that documents database activities including errors. This log can be used to monitor backup and replication processes and identify and resolve database error conditions and/or operational issues. Entries made to the log are appended to the file located in the Oracle directory called `alert_<SID>.log`, where SID is the Oracle instance name. A typical entry consists of the date and time of the occurrence and a brief description of the activity and/or error. Because the alert log continuously adds information, it should be edited to delete old information when it grows from 1MB to 2MB in size.

The log should be examined daily to monitor the database's performance for the previous day (or weekend). Under normal operating conditions the log will consist of only redo log entries occurring every hour or so, depending upon the system configuration and user activity.

A common error is an occasional replication refresh error. These do not usually require any corrective action; however, if these errors are occurring frequently, it is suggested that replication's status be checked as described Section 10.5, Troubleshooting the Database.

10.4.2 Check the Disk Usage

Maintaining adequate disk space is crucial to proper database operation. If any disk is low, space should be made available by moving and/or deleting unnecessary files.

The command

```
% df -k
```

shows how much space is used and available on each disk. If Oracle tracing is active, the trace file will grow and will need to be deleted when tracing is deactivated.

10.4.3 Check Mail in the Root Account

The backup process sends mail to root to verify the backup was performed correctly and checks the messages in the root mail box file. We recommend you save all the mail messages.

10.5 Troubleshooting the Database

------ Note Carefully ------

Before attempting to correct database problems, consider these factors:

1. Are users in this EOC performing critical duties that would be impacted if the database is modified? Since correcting the problem may take about 5 minutes, it may be appropriate to delay repairs until users are able to tolerate database aberrations.

2. The network and remote server(s) must be up and capable of was performing reliable data exchanges. If network communication is not reliable or remote servers are down, DO NOT try to correct the replication problem since additional problems may result.

10.5.1 Check for Network Problems

Perform the following steps to check for network problems:

1. Check a remote server and data link to it by typing this command:

```
% ping -s tcemsun 2000 20
```

   This sends 2000 byte packets 20 times to the remote server across the data link. If more than 90% of the packets are delivered, the server and data links are OK. If no packets or less than 90% are delivered, DO NOT proceed to the next step or try to correct the replication problem at this time.

2. The status of other cooperating servers and the Oracle database on them must be known. If a remote server is not available, trying to correct the replication problem may cause additional problems. Check Oracle at the remote server by typing this command:

```
% sqlplus username/password@listener
```

   This checks Oracle and the Listener by starting up the query tool using the SQL Listener interface. If this command hangs, the remote Listener needs to be restarted, or the network may have problems.

   If the message `Oracle is unavailable` is displayed, either Oracle or the remote server needs to be started by the Database Administrator responsible for that server. If this message is not displayed and SQL*Plus starts, Oracle is OK and replication can be

corrected at this time. If any errors were encountered, have the remote System Administrator correct them because the problem may be due to some activity in progress at the remote EOC.

10.5.2 How to Correct Oracle Database Replication

If it is established that replication of one or more servers is down and the problems which caused replication to fail have been corrected, attempt to correct replication by using the following procedures. The scripts are executed using SQL*PLUS, the Oracle utility program.

If replication is broken on your server, then use the following to correct the broken replication for username.

% sqlplus /<eoc username/password> execute <username>_update.fix

If this script does not fix replication, the next step is to restart Oracle. If that does not correct the problem, then you will have to run some of the other SQL scripts and rebuild the snapshots from scratch.

11.0 FEMIS Evacuation Applications

The FEMIS evacuation interface (`fmevac.exe`) is written in Visual Basic and resides on the PC. The Evacuation SIMulation (ESIM) model resides on the UNIX server and is invoked by the evacuation interface via the FEMIS command server (see Section 6.0, FEMIS Command Server, for more information). Import, export, and post processing utilities also reside on the UNIX server to pass information between the ESIM model and the FEMIS database. These utilities are written in PRO FORTRAN and, like ESIM, are invoked by the evacuation interface through the FEMIS command server.

11.1 FEMIS Command Server

The command server is used by the evacuation interface via the following three paths:

`File-->Import...`	(Uses `fmevacim` utility on the UNIX server)
`File-->Export...`	(Uses `fmevacex` utility on the UNIX server)
`File-->Run Case`	(Uses `fmevacex, fmevacrn` (ESIM), `fmevacpp` utilities on the UNIX server).

11.1.1 Import Function

The import function allows the user to import an existing ESIM or IDYNEV evacuation case into the FEMIS database. Once it is in the FEMIS database it may be run, modified, and/or exported.

11.1.2 Export Function

The export function allows the user to export an existing evacuation case from the FEMIS database to a flat file. This evacuation input file may then be imported elsewhere.

11.1.3 Run Case Function

The run case function extracts input information from the database to create an ESIM input file, runs ESIM, and places the model output into the FEMIS database for reporting/animation.

11.1.4 Operation Status

If the command server is invoked for any of the above operations, a wait bar will appear in the evacuation interface. When the operation is complete, the command server notifies the evacuation interface and the appropriate message is displayed to the user. In addition to waiting for a response from the command server, the evacuation interface polls the command server for a status every eight seconds. If the process is still running, the wait bar is updated. Therefore, if the wait bar is updating about every eight seconds, then the function is still operating.

11.2 Directories and Files

Each FEMIS evacuation case has its own directory on the UNIX server. This directory may contain input and output files for the case as well as command server logs for the case. Most of these files may be accessed via the evacuation interface from the `File-->View Output Reports` path. Below are lists of possible import and export/execute files for each case on the UNIX server:

Import Files:

`casefile.rni`	Output log for import program
`casefile.ini`	Control file for import program
`nnnnnnn.eri`	Log file from command server for import

Export/Execute Files:

`nnnnnnn.in`	Input file created by export
`nnnnnnn.1`	ESIM output link statistics
`nnnnnnn.2`	ESIM output signal information
`nnnnnnn.3`	ESIM output centroid information
`nnnnnnn.4`	ESIM output loading information
`nnnnnnn.5`	ESIM output summary statistics
`nnnnnnn.6`	ESIM output network-wide vehicle statistics
`nnnnnnn.7`	ESIM output error report
`nnnnnnn.grf`	ESIM output link statistics (unused)
`nnnnnnn.out`	ESIM output cumulative link statistics (unused)
`nnnnnnn.inx`	Control file for export
`nnnnnnn.rnx`	Log file from export program
`nnnnnnn.inr`	Control file for model
`nnnnnnn.rnr`	Log file from model
`nnnnnnn.inp`	Control file for post processor
`nnnnnnn.rnp`	Log file from post processor
`nnnnnnn.erx`	Log file for command server for export
`nnnnnnn.err`	Log file for command server for run
`nnnnnnn.erp`	Log file for command server for post processor
`nnnnnnn.ere`	Log file for command server for execute

The directory for a particular case may be found by starting at the directory referenced by `FemisUserTopDirNFS` in the `FEMIS.INI` file. From here the case should be in the subdirectory `/evlog/<case id>/e<exercise number>`. If you wish to find the case ID for your current case, you will find it in the header of any of the output files available under `View Output Reports` under `File`, with the exception of the one listed as `Error Report`. The exercise number is zero for real planning or real operations and user selected for exercises.

11.3 Evacuation and the GIS

Evacuation network information is stored in the database. If users wish to view this information on a particular PC, they must click the `Create Network` option under the `File` menu. The `Create Network` option uses the most recent graphical information for your current evacuation case to create a network diagram in the GIS. Once `Create Network` has been selected for a particular case on a particular machine, it does not need to be repeated unless the network is updated on a different PC. When you first open a case, you will be told if you need to run `Create Network` or if you need to execute the case.

11.4 Show Status

To check the status of your current case, click the `Show Status` button on the main evacuation screen. A message will appear saying whether or not your local copy of the evacuation network is current and whether or not the case has been run.

11.5 Oracle Tablespace

Evacuation data requires a significant amount of tablespace in the database. It is recommended that you closely manage the evacuation cases in the database. For example, delete cases which you do not want to keep, and do not copy evacuation cases into exercises unless absolutely necessary.

11.6 Troubleshooting for Evacuation Utilities

If for some reason, you cannot import or run an evacuation case through the FEMIS PC interface, you may do so via UNIX scripts as shown below.

To import the ESIM model, copy the case to be imported to the EVLOG directory, e.g., `/home/femis/user/evlog/1/e0/tead.tdt`. Then run a script similar to the following but substitute your local site values for the values in the example.

```
#!/bin/sh
cmdserv - 9015 <<EOD
run import

DEBUG=Y
IDYNEV=N
CASEID=1
EXERNUM=0
FILENAME=tead.tdt
DATABASE=fi6
USERNAME=AEMA
PASSWORD=AEMA
WHERE=NW

EOD
```

To execute ESIM model, run the following script.

```
#!/bin/sh
cmdserv - 9015 <<EOD
run execute

DEBUG=Y
IDYNEV=N
CASEID=1
EXERNUM=0
FILENAME=tead.tdt
DATABASE=fi6
USERNAME=AEMA
PASSWORD=AEMA
SUBCODE=ere

EOD
```

Note: To import or run an evacuation case from the UNIX side should be treated as a last resort for debugging purposes. Running cases through the user interface is the preferred method for importing and running cases.

12.0 Electronic Mail Service

This section discusses accessing position mailboxes, tips for using Novell GroupWise Notify and GroupWise security.

12.1 Accessing Position Mailboxes

Requests to access a position mailbox are only kept for one session, so Steps 1 through 3 will need to be repeated each time a user logs in unless the workaround below is used.

1. Log in to your personal mailbox.

2. Click the `File|Proxy` menu item. The proxy mechanism is what will be used to access the position mailboxes from your personal mailbox.

3. Enter the name of the position mailbox for the user ID that you want to access. Otherwise, click the `Users` button, click on a position name in the list, then click OK. Repeat Steps 2 and 3 for each position mailbox you need to access.

   Note: If you attempt to establish a proxy connection to a position mailbox that has not given you permission to access it, you will receive a message saying, `Access to user denied`. See your E-mail System Administrator if you should have been given access to that position mailbox.

Once Steps 1 and 2 are completed, users can switch between their personal mailboxes and authorized position mailboxes by using the proxy button in the bottom left corner of the screen. The button is labeled with a person icon. Clicking on it will cause a menu to appear containing the user's own mailbox name and the names of the position mailboxes that were requested in Step 3.

Workaround - To keep the proxies from disappearing on logout:

Having completed Steps 1 through 3, open the InBox for each proxy. Drag the icon in the upper left corner of each InBox to the white "shelf space" area in the GroupWise main screen, and then close all of the InBoxes. The `File|Properties` menu item can be used to change the label on the resulting icons to reflect the proxy name. There are two drawbacks to this workaround. First, shelf space settings are stored by GroupWise per system, not per user. If another user that does not have access to the same proxies tries to log on to mail on that system, the message `access denied` is displayed for each unauthorized proxy. However, the user is allowed to logon and use authorized

proxies. Second, in some cases, renaming the icons causes the icon to disappear leasing only the icon label. Clicking on the label is sufficient to access the mailbox. This is a GroupWise bug with the Windows operating system.

12.2 Tips for Using Notify

GroupWise Notify, the application that notifies the user when there is new mail, does not tell the user which mailbox received the new mail. However, the user is given an indication new mail is in their personal mailbox or in a proxy mailbox. Clicking on the subject line of a new message listed in Notify will cause the `Read` button to be enabled if the mail is in the personal mailbox and disabled if the mail is in a proxy mailbox. Alternatively, you can have Notify beep the user. The user can then go directly to GroupWise and use the proxy button menu to quickly scan the InBoxes.

12.3 GroupWise Security

The user databases, including both messages and attachments, are encrypted with the GroupWise format which prevents the viewing and editing of mail without the GroupWise client. However, since the GroupWise client requires write access to the mailbox and notify directories, it is possible for an unknowing user to remove files and directories from within the post office directory structure. The following steps have been take to minimize the impact of this type of situation:

1. The client connection to the network drive is connected at the post office directory level to separate the GroupWise domain files from the user.

2. The FEMIS install will modify the GroupWise configuration when the FEMIS files are configured. The install will assign the `femisrun` group to all files and directories in the post office directory structure. This allows non-privileged FEMIS users to read mail without the ability to change GroupWise domain parameters.

3. System Administrators are fully responsible for the security of their systems. Actions such as changing file protections or removing passwords jeopardize security and leave open the possibility of malicious and/or naive actions by users that could seriously affect the ability of the EOC to respond to an emergency.

13.0 FEMIS PC Workstations

The FEMIS client software permits emergency management personnel to perform their jobs. It consists of a user interface which provides a variety of functions necessary for managing an emergency. This software interfaces seamlessly with the installed COTS applications and the network software. It is a user interface that brings together the familiarity of the COTS software and the power of client-server computing and emergency management information interchange.

The FEMIS client software is delivered on UNIX-compatible media. This media contains the user interface software and its supporting programs and files required to configure a standard IBM-compatible PC into an emergency management workstation. These files should be loaded on to the FEMIS UNIX server.

The recommended PC platform should have a Pentium central processing unit (CPU) with 32MB of RAM, and 1.2GB of disk space. It is recommended that the target PC workstations be configured with the standard SVGA video drivers. The minimum display resolution is 640x480 pixels, using 256 colors.

FEMIS will run on an 80486 platform that features 60 megahertz (MHz) or better CPU, 32MB RAM and a 800MB hard disk (recommend 1.2GB) but performance in graphics applications will be unacceptably slow. To increase GIS performance, remove the raster image maps from the GIS. Users who need FEMIS GIS or graphics functionality should select the preferred Pentium-equipped, faster PC platform.

The preferred PC Client platform is the Pentium-equipped PC configured as follows:

Intel Pentium Microprocessor PC
- 60MHz or better
- 32MB RAM
- 1.2GB Disk
- 32 bit, 30MHz (or better) Local Bus
- 32 bit (or better) graphics accelerator card, Local Bus design
- Internal CD-ROM drive
- 1.44MB 3.5" internal floppy drive
- 1 parallel / 2 serial ports
- 3COM (3C509, 3C509-TP) Ethernet Adapter card (10MBits/sec, 10Base2)
- 17" color VGA monitor (SVGA capable)
- Standard 101 key keyboard
- Mouse.

13.1 COTS Software

The COTS software that needs to be installed prior to installing the FEMIS software are the following:

ArcView v3.0 GIS
Hummingbird NFS Maestro v5.1.1
Microsoft Office v4.3 including:
    Microsoft Excel v5.0 or better
    Microsoft PowerPoint v4.0 or better
Microsoft Project v4.0 for Windows
Microsoft Windows NT Workstation (CD-ROM edition), v 3.51 (1)
Oracle SQL*Net v2.0
Oracle TCP/IP adapter v2.0
WordPerfect for Windows v6.0 or better.

Note:

1. The version specified includes documentation. Additional licenses may be obtained without documentation by procuring the Windows NT License Pack.

Refer to the COTS software manuals to install the software.

13.2 FEMIS Software

See Section 3.2, Installing the FEMIS PC Software, for details on installing and configuring the FEMIS client software.

13.3 Backup Procedures

Software backups and archiving are highly recommended as part of normal system administration, operations, and management. The EOC and site System Administrator should become familiar with a backup utility and practice those procedures to comply with their information system policies. Windows NT provides a backup utility for archiving data to tape.

14.0 FEMIS UNIX Server

The FEMIS UNIX server software provides notification between servers, the transfer of data between FEMIS and EMIS, the capability to gather meteorological data, and the ability for PCs to use the server resources for large mathematical model/simulation codes. The UNIX software consists of the FEMIS host Notification Service, the FEMIS command server, the FEMIS Met application suite, and the FEMIS Data Exchange Interface (DEI). These services, combined with the UNIX COTS applications, provide the structure for the FEMIS software.

14.1 Maintenance of the FEMIS UNIX Server

Consistent server maintenance is essential for FEMIS operation. The following steps should be taken regularly to monitor and maintain the server.

14.1.1 Monitor Oracle and FEMIS

The UNIX FEMIS Monitor can be used to monitor critical FEMIS functions. These functions include the FEMIS Notification Service, the FEMIS Command Server, the FEMIS DEI, the number of Oracle PC connections, the Oracle Listener, and Oracle replication. For more information on the FEMIS Monitor, see Section 4.0, FEMIS Monitoring Tool. For further Oracle maintenance, see Section 10.4, Performance Maintenance.

14.1.2 Perform System Backups

System backups are critical to data recovery. It is highly recommended that each EOC establish backup procedures. For more information on Oracle backups, see Section 10.3, Backup Procedures. For information on server backups, see the following section.

14.2 Backup Procedures for the FEMIS UNIX Server

Software backups and archiving are highly recommended as part of normal system administration operations and management. Example scripts are delivered to perform these tasks. The EOC and System Administrator should become familiar with the examples and make any modifications necessary to comply with their information system policies.

The backup files are located in the `install/backup_template` directory and include the following:

`README.backup`	
`backup.sh` -	The script which performs backups.
`backup.sh.1` -	The backup.sh man page.
`backup_system_full` -	The control file template for full backups.
`backup_full_data_file_1` -	The data file template for tape 1 of the full backup.
`backup_full_data_file_2` -	The data file template for tape 2 of the full backup.
`backup_system_inc` -	The control file template for incremental backups.
`backup_inc_data_file_1` -	The data file template for tape 1 of the incremental backup.
`backup_check.sh` -	The script to check for successful backups and call the Oracle export and archive log removal script.

To customize the backup templates for your site, complete the following steps:

1. Create the `/apps/backup` directory.

2. Copy the backup files to `/apps/backup`.

3. Configure the backup templates for the system. Each backup data file will write to one tape. If more than two full or one incremental backup tapes are required, create a new data file and add the new data file to the appropriate control file.

To run an Oracle archive removal script:

1. Uncomment the `backup_check.sh` line in the `backup_system_full` file.

2. Edit the `backup_check.sh` script to verify the `EXPECTED_LOGS` variable is accurate.

3. Modify the `ORACLE_REMOVE` variable to call the Oracle file removal script.

To run an automated backup, load the appropriate number of tapes and add the following to the root crontab:

```
#
#       Backups
#
35 0 * * 2 /apps/backup/backup_system_full > /dev/null 2>&1
30 0 * * 3-6 /apps/backup/backup_system_inc > /dev/null 2>&1
```

To perform backups manually, load the appropriate number of tapes and run the following commands:

Full backup - performed Monday evenings:

```
# /apps/backup/backup_system_full &
```

Incremental backups - performed Tuesday-Friday evenings

```
# /apps/backup/backup_system_inc &
```

14.3 Troubleshooting the FEMIS UNIX Server

The following items are provided for the System Administrator to aid in the administration of FEMIS. For more information on the COTS products, please refer to the documentation provided by the vendor.

14.3.1 FEMIS Troubleshooting

If FEMIS processes are down the following commands may be used to stop and restart all FEMIS processes.

```
# sh /etc/init.d/femis stop
# sh /etc/init.d/femis start
```

14.3.2 Oracle Troubleshooting

In the event of an abnormal server shutdown, while attempting to start, the Oracle Listener may return an error similar to "Network name not unique on network."

To resolve the problem, remove the `/var/tmp/o/s<SID>` file and restart the listener.

For further Oracle troubleshooting see Section 10.5, Troubleshooting the Database.

14.3.3 Maestro

PCs may receive the following error when trying to connect to the server.

```
Network Timeout or HCLNFSD/PCNFSD not running on Host.
```

This error message typically occurs for one of the following reasons:

1. The `mountd` daemon is not running on the UNIX server.

2. The `HCLNFSD` daemon is not running on the UNIX server.

3. The NFS locking daemon is hung on the UNIX server.

4. The 32 bit record locking is not enabled on Windows NT systems

For problem 1, start the `mountd` daemon.

```
# sh /etc/init.d/nfs.server start
```

For problems 2 and 3, stop the NFS Maestro daemon, if it is running.

```
# sh /etc/init.d/hclnfsd stop
```

Restart the daemon

```
# sh /etc/init.d/hclnfsd start
```

If the error continues, it may be necessary to stop and restart the server locking daemon. Stop the NFS Maestro daemon, if it is running.

```
# sh /etc/init.d/hclnfsd stop
```

Stop `lockd`

```
# sh /etc/init.d/nfs.client stop
```

Restart `lockd`

```
# sh /etc/init.d/nfs.client start
```

Restart the NFS Maestro daemon

```
# sh /etc/init.d/hclnfs start
```

For problem 4, add `NOV3` to the registry on each Windows NT system. On the Windows NT systems, go to `File->Run` and enter `regedit32`. Then complete the following:

1. Go to `HKEY_LOCAL_MACHINE` on the local machine folder.

2. Go to the Software folder -> Hummingbird -> NFS Maestro ->NFS Client.

3. Go to `Currentversion`.

4. Go to the `Edit` Menu and select `add value`.

5. Enter `NOV3` for the value name.

6. Set the date type to `REG_DWORD`.

7. Enter `1` for Data.

8. Leave the radix as `HEX`.

9. Close `regedt`.

10. Reboot the Windows NT machine.

15.0 System Management

This section includes information on the authorization of FEMIS users, user login, access privileges, FEMIS usage and user interface; and system manager utilities, which includes maintenance of user accounts and site profiles.

Note: FEMIS system security is provided through the FEMIS system administration utilities and is the responsibility of the System Administrator.

15.1 Authorization

The purpose of authorization is to provide the FEMIS system with a means to validate user authorities as they pertain to the access of functions and information. The objective is to provide this service at the workstation level of the system architecture. This approach depends on a user profile which stipulates the user roles and information access authorities. Given this, it is possible to construct a session authorities profile. This is in turn used to configure the user interface and limit the range of functions and information available to the specific user.

To ensure that access to information is given through proper authorization procedures, access validation works in conjunction with login, control points, and user session profiles to grant access permissions. This is implemented as a local validation engine which knows all the authorities associated with the current user's session. This engine is called upon to validate privileges required to pass beyond a control point within the user interface software. This validation matches required privileges with those of the current user. The current user's privileges are contained in a session profile which was constructed during logon. Any query for validation is handled by matching the required authorities with a subset of the current user's authorities.

The control points provide a measure of control in how much information is available to the user at a given time. They also provide a measure of security in the access of the system. Information presentation is controlled by limiting the availability of functions at the user interface. The control points are used to enable or disable menu items, buttons, and other means that activate functions that provide data.

15.1.1 FEMIS Users

Titles, numbers, and responsibilities of EOC personnel vary from site to site. In smaller organizations, several roles are played by a single person; while in larger organizations related responsibilities may be assigned to more than one person. It is also common for many positions in the local EOC to be filled by volunteers during emergency response. The

descriptions that follow are intended to be as generic as possible. These descriptions are not comprehensive of all possible functions of an EOC. They describe functions to which FEMIS expects to make a positive contribution.

15.1.1.1 Decision Maker

This person or group of persons must rely on information provided by their staff to make decisions regarding protective action decisions, deployment of resources, and public communication. FEMIS support to decision makers will be clear presentation of information including geographic representations (maps), resource and task status information, and communication from other EOCs.

15.1.1.2 EOC Operator

On a day to day basis, this person will use FEMIS to perform (or confirm) hazard analysis, make protective action recommendations or decisions (Such decisions will have been considered and approved for this situation by the decision makers ahead of time), check resource availability, and confirm their jurisdiction's ability to respond in the pre-agreed manner.

15.1.1.3 EOC Director of Operations

In an event, this person is in charge of the EOC. While the director may not actually be touching the keys, it is important that this person be thoroughly familiar with FEMIS so that the information FEMIS is able to provide is properly used.

15.1.1.4 Communications Officer

Most EOCs currently have a person in charge of communication traffic. The communications officer's responsibilities include routing and logging of messages received by phone, fax, and radio. FEMIS allows more widespread access to information than was previously available. Control of this information, including assurance that the information gets to its proper destination and the information is managed to prevent overload, is an issue of concern to both the EOC personnel and FEMIS developer.

15.1.1.5 Agency Coordinator

During an emergency, representatives from other agencies such as police, fire, Red Cross, department of natural resource, and department of education come to the EOC to provide liaison between the emergency management organization and their organization. They need to provide their agency with current information in order to provide support to the emergency effort.

15.1.1.6 Planner

On a day to day basis, the emergency planners are the most intense users of FEMIS. It is the planner's responsibility to preplan the agency's response. This response includes assessing potential hazards, writing plans, arranging for availability of resources, and coordinating plans with other responding agencies. During response to an emergency, the planners can be expected to use FEMIS (because of their in-depth knowledge of the system) to obtain the information requested by decision makers in the EOC.

15.1.1.7 Training/Exercise Coordinator

This person is in charge of ensuring that members of their agencies are trained appropriately for their responsibilities. One training method often used in emergency management that must be supported by FEMIS is to "exercise" response to a specific hazard under specified conditions.

15.1.2 User Login

Users logging in to FEMIS are identified by their user ID and password, which are predefined in the FEMIS database by your System Administrator. When users login at a FEMIS workstation, they are asked for their user ID and password. This is validated against the database, and a session is established.

The database uses the user ID to retrieve the privileges defined for this specific user. This set of privileges is forwarded to the workstation where it is kept as part of the user's session. When the FEMIS software is initialized after a successful login, the session privileges of the current user disable certain access to functions in the user interface.

15.1.3 Privileges

Applications executed by the current user programmatically validate access privileges through the use of control points. Control points define and validate the privileges required to pass beyond the current point in the user interface. Other information, accessible through functions, can be further restricted based on the user's information access privileges. Access privileges are provided to grant or deny the viewing and/or changing of the information held in the FEMIS system. The three categories of privileges are Browse, Edit, and Create. Create is the highest privilege and subsumes Edit, which subsumes Browse (lowest privilege).

Privilege Guidelines:

1. Each mode listed below has a set of privileges

   - `real_world/operations`
   - `real_world/planning`
   - `exercise/operations`
   - `exercise/planning`
   - `exercise_control.`

2. The privileges established for a user in the Planning mode are applicable to all planning.

3. The privileges established for a user in the Exercise mode are applicable to **all** exercises.

4. Privileges are hierarchical in that a user with Edit privileges will be able to Browse the information and use the subsystem and/or module. The user will be able to have the following privileges for each FEMIS decision control point:

   Browse--Allows the user to only view (not edit) data.

   Edit--Allows the user to view data directly and to modify any viewed records. Subsumes Browse.

   Create--Allows the user to create new data records and to read or edit any records already written. Subsumes Browse and Edit.

5. There are cases where the linear precedence relationship among the privileges will not be adequate. These cases will be documented and handled on a case-by-case basis.

15.1.4 FEMIS Usage

Permission to display information to the current user must be validated. Any interaction with the displayed information must likewise be validated and could be manifested as disabled or enabled menu items or other controls. During the course of using the FEMIS system, the user access functions provides by the user interface. Whenever a control point is encountered, a check with the user session is made to ensure valid access to the information. If valid, the user's privileges are used to configure the next window prior to its display. Appropriate buttons and other controls are disabled according to the current user's privileges as stipulated by the session. The system will propagate the authorities for the functions and authorized information in whatever form is compatible with the ultimate provider of the functions and information (e.g., the FEMIS database). The objective is to provide a user with enough capabilities at the user interface to permit effective performance of the emergency management roles and to protect others from unexpected results.

15.2 System Administration Utilities

The system administration utilities of the FEMIS software provide functionality to define and modify user accounts, maintain the site profile, and clear locks on databases. This portion of the document will provide instructions for the operation of the system administration utilities of the FEMIS software.

The FEMIS client software supports, among other functions, the maintenance of user accounts. To perform FEMIS system administration, select `System Administration` from the `Utilities` menu.

A System Administration window will display with the following choices:

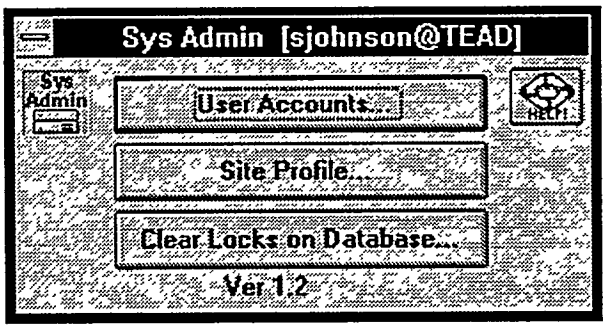
User Accounts
Site Profile
Clear Locks on Database

Click the `User Accounts` button to perform the following activities:

Add a User
Delete a User
User Information
Set user Privileges

Click the `Site Profile` button to edit the EOC objectives and to Define Positions.

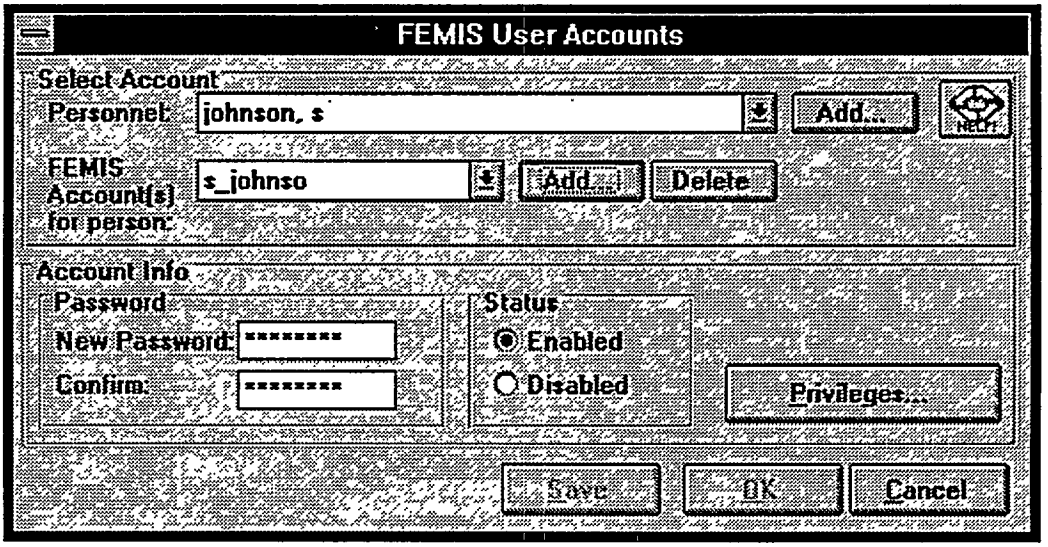
Click the `Clear Locks on Database` button to clear either single-user or all locks on FEMIS functions.



15.2.1 User Accounts

This form enables you to add, delete, and edit FEMIS user accounts. From The Sys Admin window, click the `User Accounts` button. The FEMIS User Accounts window will display.

Note: When your privileges are changed by your System Administrator, you must log out and log back in to FEMIS for the new privileges to take affect.



15.2.1.1 Operation

The `Select Account` section at the top of the window has two drop-down lists. The `Personnel` list contains a list of all the people in the FEMIS Personnel database. New people can be added using the `Add` button.

Note: The `Add` button allows you to add the minimum information about the person (their name.) To add complete information or to delete people from the Personnel database, use the following: under `FEMIS`, select `Data`, `Databases`, and then `Personnel`.

The `FEMIS Account(s) for person` list contains a list of either all the FEMIS user accounts or the FEMIS user accounts for a selected person. Selecting an item in this drop-down list will enable you to edit the information about this account, such as the FEMIS login password, whether the account is enabled or disabled, and the privileges for this account.

Selecting an item from the `Personnel` drop-down list will show only the user accounts in the lower drop-down list that are owned by the selected person. Selecting an account from the `FEMIS Account(s) for person` drop-down list will select the person from the upper drop-down list that owns the selected account.

You can both add or delete user accounts by clicking the buttons next to the `FEMIS Account(s) for person` drop-down list.

When adding accounts, complete the following steps:

1. The person selected from the `Personnel` drop-down list is the owner of the account (one person may own many FEMIS accounts.)

2. The default password is the same as the account name. (The account JSMITH will be given the default password JSMITH.)

3. The account name must not have already been used.

4. The account will have no privileges after it is created.

The lower part of the FEMIS User Accounts window enables you to change information about a selected account.

Password: The password must consist of only the characters A-Z, 0-9, and _ (underscore). The maximum password length is eight characters.

Status: The `Status` radio buttons enable you to disable (or enable) an account so no one can log into the account. The account is not deleted, so information about privileges, etc. is not lost.

Privileges: The `Privileges` button enables you to edit the privileges for the selected account.

Save: Saves changes but leaves the form open so you can select other accounts to edit.

OK: Saves changes and also closes the form.

Cancel: Discards changes made to the User Accounts form (but does not affect changes to privileges) and closes the form.

15.2.1.2 Privileges

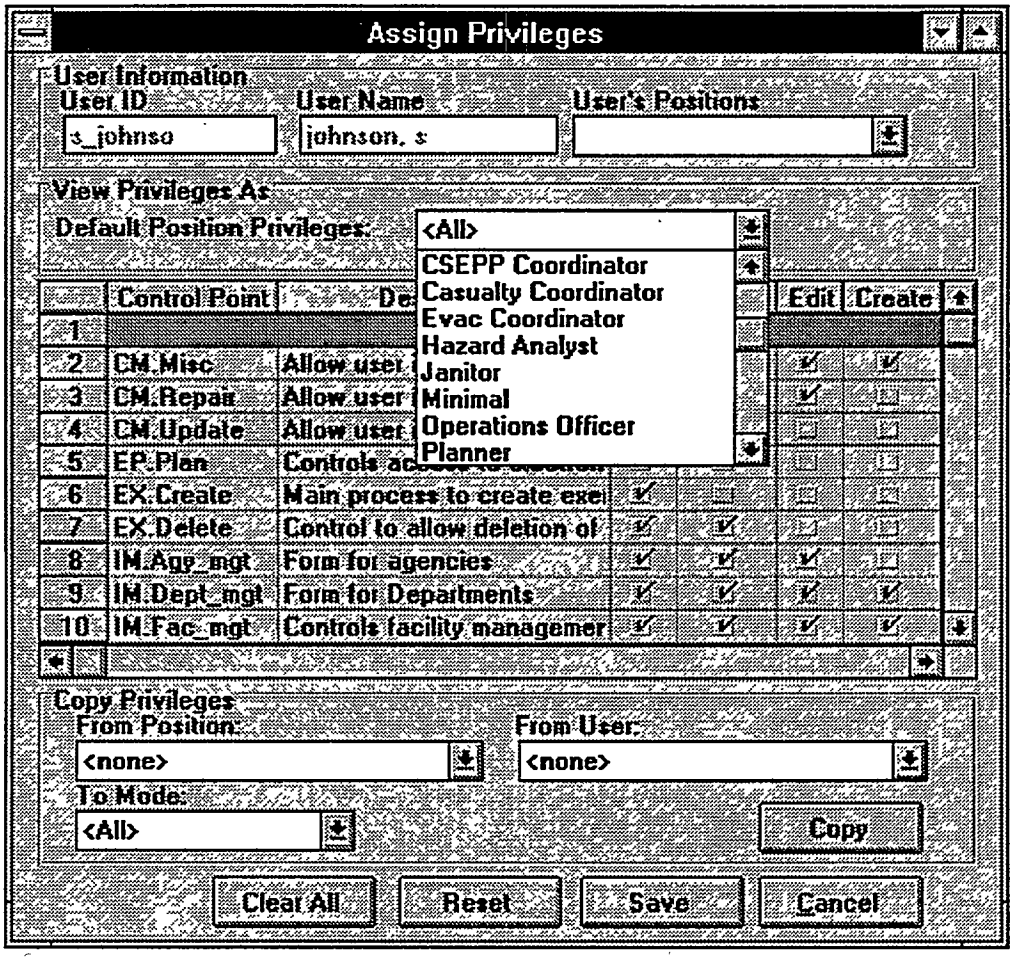
Privileges are used to control access to certain portions of FEMIS. If you lack the privilege to perform some activity, the menu item or button will be either disabled (grayed out) or invisible. To access: Select `System Admin` from the Utility pull-down menu. Click the `User Accounts` button. Click the `Privileges` button on the FEMIS User Accounts window.

If a menu item or button that you expect to be enabled or visible is not, contact your System Administrator, who can give you the required privileges by using the system administration function in FEMIS.

Complete the following steps to Assign Privileges:

1. Click the `Assign Privileges` button on the User Accounts window. The Set Privileges window will display.

   The user information you entered or previously selected will be displayed in the User Information fields. User's positions are defined in the Add Person module of the personnel database. Any positions assigned to the user will be displayed in the User's Positions list.



2. When this window displays, `<all>` available control points and their descriptions are displayed in the checkbox grid. The current privileges given to the user for each control point is shown as a red check in the applicable checkbox for each mode.

   To view only the control points assigned to a specific position and the level of privileges given as the default for that position, select the position from the `Default Position Privileges` drop-down list. The grid will then display only those control points that have privileges assigned for that position. The level of privilege assigned to the position is indicated by an `x` next to the applicable checkboxes. The actual privileges assigned to the current user still display as a red check in the checkbox. To again view all of the possible privileges, select the `<all>` option from the `Default Position Privileges` drop-down list.

3. Use the drop-down menus in the `Copy Privileges From` section of the window to copy the privileges of a selected Position(s) and/or User(s) to the account. You can copy privileges from a position and another user simultaneously. You can also select the mode(s) you want the privileges to be copied to from the `To Mode` drop-down list. Click the `Copy` button to copy the privileges from the position(s) or user(s) selected.

4. Copy each applicable position's privileges that are necessary for the account being set up or modified. The position privileges are defined in the `Site Profile` section of this document.

5. Select the appropriate level of privileges for each control point. The lowest to highest privileges are as follows: Browse, Edit, and Create. Create enables you to create, edit, and browse the files. Edit means you can open, edit, browse, and use the files. Browse means you can only read the files.

6. Click the `Save` button to save your privilege settings and the User Accounts window will redisplay. To exit without saving the settings, click the `Close` button.

7. Click the OK button to save the account information and the `System Administration` menu will redisplay. To save the account information and remain at the User Accounts window, click the `Save` button. To exit without saving the settings, click the `Cancel` button.

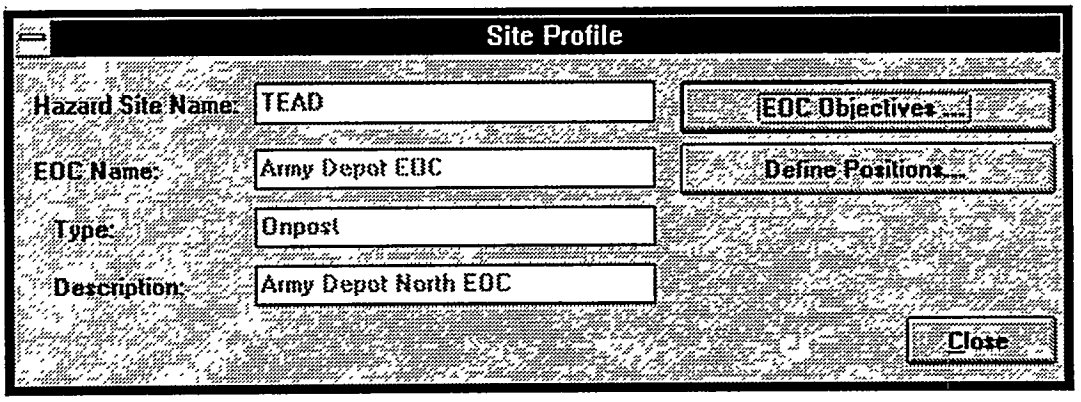
8. The system will display a message similar to the following: `Account Information Saved`. Click the OK button. The System Administration window will redisplay.

15.2.2 Site Profile

FEMIS supports the maintenance of site profiles. After you click the `Site Profile` button in the System Administration window, the Site Profile window will display.

You can perform site account maintenance activities from this window by clicking on the EOC `Objectives` button or the `Define Positions` button.

Note: You must have the correct privileges to edit the Site Profile.

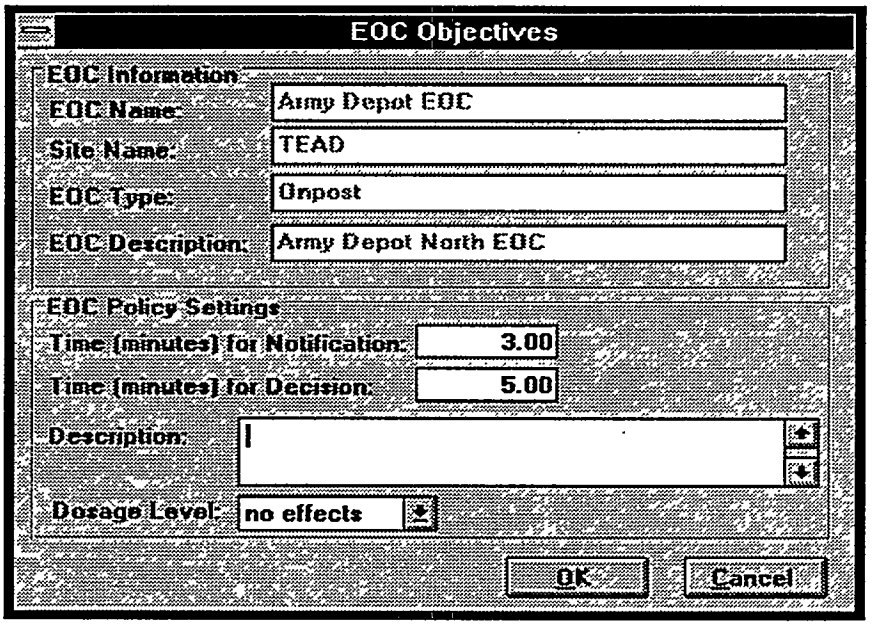


15.2.2.1 EOC Objectives

From the Site Profile window click on the EOC `Objective` button to display the EOC Objective Settings window.

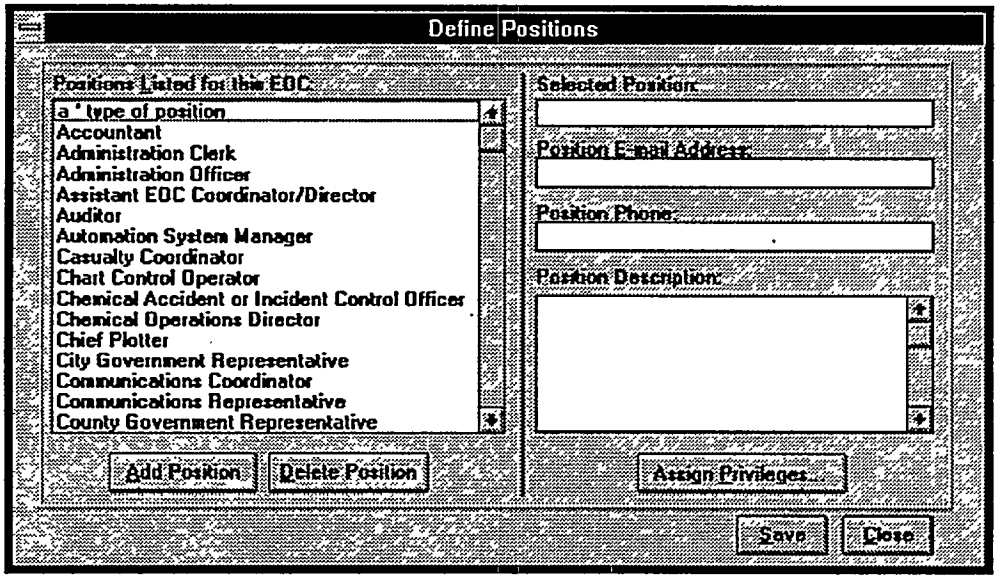
The EOC Information displayed in the upper half of the window is view only and cannot be changed from this window.

The EOC Policy Settings can be edited and changed to reflect the policy of your EOC. Change the various times, description, and dosage level as required. To save the changes, click the OK button. To exit without saving, click the `Cancel` button.

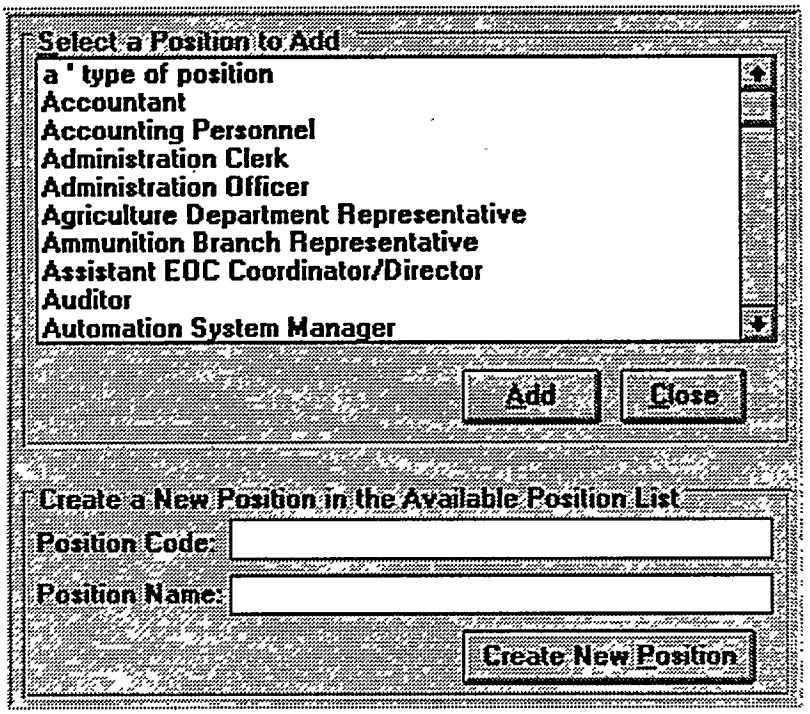


15.2.2.2 Define Positions

From the Site Profile window click on the `Define Positions` button. The Define Positions window will display. To define positions, perform the following procedures.



1. The Define Positions window enables you to `Add Position` and `Delete Position` and to `Assign Privileges` to positions.



2. To add a position, click the `Add Position` button. The Select a Position to Add window will display. Select a position from the `Available Positions` list or type in a new position code and position name in the Create a New Position section. Click the `Create New Position` button to add the new position to the Available Positions list. After adding the position, highlight the position in the Available Position list, then click `Add` to add the position to the EOC's list of defined positions. Click the `Close` button to return to the Define Positions window.

3. Select the position from the Positions Listed for This EOC list. The position will display in the Current Position field. Type the position E-mail Address, Phone, and Description in the fields available. Click the `Assign Privileges` button to assign privileges to the new position.

4. The Set Privileges window will display with the name of the selected position in the Position Information Name field. You can compare the default privileges for other positions by selecting a position from the View Privileges As Default Position Privileges drop-down list.

   Option A. Select the level of privileges for each control point by clicking on the check boxes under the type of privilege you want. The available privileges are Browse, Edit, and Create (lowest to highest level).

Option B. You can also elect to copy privileges from a Position or User by selecting from the drop-down lists at the bottom of the window. Click the Copy button to copy the privileges over to the current position. These privileges will display as red checks in the privilege grid.

5. Click the Save button to save the privileges and remain at the Edit Privileges window. Click Reset to reset the privileges to any preexisting defaults. Click Clear All to remove all privileges. Click Close to return to the Define Position window.

6. Click OK or Cancel to close the Define Position window and return to the Site Profile window.

15.2.3 Clear Locks on Database

FEMIS provides several locking functions to protect data being edited by one user. There are times when you may want to break a lock on a particular item.

15.2.3.1 Clear Locks Function

A person with System Administrator privileges can use the system administration program to cleanup locks for either specific users or all users.

Notifications will be sent for locks that are deleted.

15.2.3.2 Locking in Overview

Locking is designed to minimize the possibility of several users editing the same item at the same time within FEMIS. On most forms when you click the Edit radio button or otherwise switch to edit mode, FEMIS will lock the data for you to edit.

If someone else is already editing that data, on many windows you will be prompted to indicate if you want to break their lock. If you break their lock, two or more users (including yourself) are probably editing the same thing at the same time. This will cause problems if both of you attempt to save the data.

Note: It is not recommended procedure to break a lock on a FEMIS function. Breaking locks will cause problems if both of you attempt to save the data but may be necessary during emergency situations.

In addition, the user whose lock is broken will be notified by FEMIS with a message indicating which lock was broken and the person who broke it. If possible, call up the person who broke your lock and check to see who requires precedence.

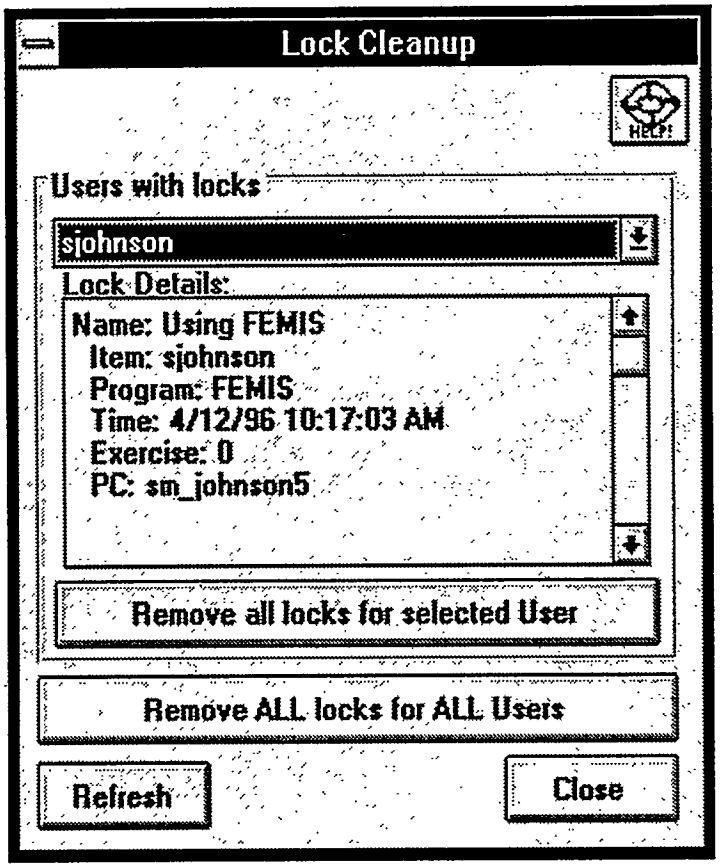
15.2.3.3 Cleaning Up Locks

Locks are cleaned up by several methods (in case of a system crash while you have things locked):

1. When most FEMIS sub-programs start or exit, they clean up any locks from the current user at the current machine for the program that is starting.

2. When FEMIS starts or exits, it cleans up any locks from the current machine for the current user from all FEMIS programs. It will also ask about cleaning up locks from the current user on all machines if needed. Since these are your own locks being broken, there is no notification message sent.

3. A System Administrator can use the Clear Locks function described above.



16.0 FEMIS PC Utilities

The FEMIS PC utilities include the following programs:

```
WINECHO
FIXINI
SRVCTL
CMDWIN
SYSENV
FEMISCHK
REG2INI
SETUP.
```

16.1 WINECHO

This program is for use by NT-DOS batch files running under Windows NT and allows a batch file to give a message to the user in a normal Windows message box. This utility is used by several batch files used by the setup program.
*

Usage:

```
WINECHO message text.
WINECHO [/Beep] [/Info] [/Warn] [/Stop] /Msg:message text.
```

Parameters:

`/Beep`	Beep the speaker
`/Info`	Use the information icon in the message box
`/Warn`	Use the warning icon in the message box
`/Stop`	Use the stop icon in the message box
`/Msg:`	Any text following `/Msg:` will be shown in the message box. If any other parameters `/Beep`, `/Info`, etc are specified, then /Msg: must be specified.

16.2 FIXINI

This program fixes the `FEMIS.INI` file by determining the PC name and setting the correct paths and filenames for all the COTS packages used by FEMIS. This utility is used by the setup program to fix the `FEMIS.INI` file.

If any command line parameters are specified, then the program exits immediately after fixing the file. Otherwise it will wait for the user to click OK.

16.3 SRVCTL

This program allows starting and stopping of Windows NT services from the command line. This program is used by the setup program to start the NTP service to synchronize the PC's time with the server.

Usage:

```
-s ServiceName  Starts service "ServiceName"
-e ServiceName  Stops service "ServiceName"
```

Note: The `ServiceName` passed is case sensitive. It must be entered exactly as it appears in the Control Panel.

16.4 CMDWIN

This program allows a NT-DOS window running under Window NT to control how its window is displayed. This utility is used by several batch files used by the setup program.

Usage:

```
cmdwin [options] /title:Window Title
```

`/title:` Some text that will be found in this window's title. Best used with the TITLE command to set the title of the NT-DOS window to some specific text.

Options:

`/min`	Minimize the window
`/max`	Maximize the window
`/norm`	Restore to original size
`/show`	Bring window to front
`/top`	On top of all other windows
`/notop`	No longer on top of all other windows
`/flash`	Flash the window a bit to attract attention.

16.5 SYSENV

This program allows you to set and delete Windows NT system environment variables from the command line. You must log out of Windows NT and log back in for changes to take effect, and you must have Administrator privilege for the program to work. This program is used by the setup program.

Usage:

`sysenv /?`	View Help/Instructions
`sysenv x y`	Set variable x equal to value y
`sysenv x`	Delete variable x.

16.6 FEMISCHK

This program determines if any of the DLLs or VBXs installed on the computer may not be the ones expected by FEMIS. Incorrect versions of DLLs or VBXs may cause FEMIS to work incorrectly.

If you are having strange problems on one PC, especially if the problems started after installing some software onto the PC, use this program to see if the installation may have changed some file expected by FEMIS.

16.7 REG2INI

This program copies the time zone information from the Windows NT registry into the `FEMIS.INI` file and is used every time a FEMIS program starts. Click on the `Date/Time` icon in Windows NT Control Panel to change your time zone information for FEMIS--do not change the entry in the `FEMIS.INI` file.

16.8 SETUP

See Section 3.2, Installing the FEMIS PC Software.

17.0 Troubleshooting

☐ **Common D2PC Errors**

If an error message occurs that states *"The D2PC run cannot be logged,"* several items in FEMIS should be checked:

- Verify that the `FEMIS.INI` file is pointing to the proper place on the server to log D2PC runs. This file should be on the `M:\` drive.
- Verify that the PC connected properly to the server (if there is no M: drive) during startup. The `M:\` drive should be properly connected; if not, disconnect and reconnect to the correct path.
- Verify the user has the proper privileges on the UNIX server to log the D2PC case.

☐ **Common Login Errors**

If the FEMIS Login window does not work for any reason, review Section 3.2, Installing the FEMIS PC Software, to verify that all of the installation steps have been completed. The following is a list of the most common items to verify:

- Verify the EOC table in the database has not been updated to include the name of your server. To update, see Section 3.3, Configuring the FEMIS Setup Program.
- Verify the FEMIS database Listener is active. If not, start the Listener.
- Verify that the `TNSNAMES` file has been moved to the `C:\ORAWIN\NETWORK\ADMIN` directory. If not, move the correct `TNSNAMES` to the `C:\ORAWIN\NETWORK\ADMIN`.
- Verify that the usercode/password is valid. Check with a System Administrator to set up a new usercode/password.
- Verify that the ODBC data source has the proper connection information. See Section 3.1.4, Installing Oracle ODBC, to rerun the ODBC connection utility.
- Verify that the system is pointing to the correct default EOC. Rerun Change Default Database to identify the default EOC for your workstation.

- Verify that the FEMIS Command Line and Working Directory are correct. From the Windows Program Manager, click (highlight) the FEMIS program item (icon). Under the File Menu Bar File, select Properties. Ensure that the Command Line path is `C:\FEMIS\FEMIS.EXE` and the Working Directory path is `C:\FEMIS`.

☐ **Common Tracking Navigator Errors**

When viewing data from other EOCs, the Tracking Navigator window is gray and empty or error messages appear in the Tracking Navigator cells. Check the following items:

- Verify the databases at the effected EOC are active.
- Verify the Oracle Replication functionality is working properly.
- Verify that the user has the appropriate privileges. If not, assign the appropriate privileges for the user.
- Verify that no data has been added to the other EOCs.

☐ **COTS Software--Accessing Problems**

COTS software packages (ArcView, GroupWise, Mircrosoft Project, spreadsheet or word processing) cannot be accessed from FEMIS, and the option is grayed out.

- Verify that the software has been installed.
- Verify the FEMIS.INI file has the correct path to the COTS. If not, run the `C:\FEMIS\FIXINI.EXE` to correct the path of the COTS software.

☐ **Creating Temporary Working Database Error**

If you get an error message stating *"Error creating temporary working database."* this means that something is wrong with the Access database on the PC used for working information.

- To correct this error, logout of FEMIS on the PC, and delete the directory `C:\FEMIS\USER\<user>\ETC` where `<user>` is the username of the person having the problem on the PC. You can also delete all the directories under `C:\FEMIS\USER` if other files have not been stored there.

☐ **Display Problems**

If you are in Help and your hypertext links are not green, the problem could be with how your colors are set up and displayed on your PC. The links will still work.

- If you have this problem, check with your System Administrator to change the display setup.

☐ **Electronic Planning (Planning Mode) Errors**

FEMIS cannot find Microsoft Project.

- Verify that the Microsoft software has been installed or that the `FEMIS.INI` file has been updated to provide the proper path to the software. Run the `C:\FEMIS\FIXINI.EXE` program to fix the path.

OLE Error when reading the database. If you are only able to run the electronic plan from your default EOC, check the `Current Info` item under the Help Menu Bar to ensure you are logged into your default EOC. If you are logged into your default EOC, you must have an Access Database "attached" to the Oracle database for your EOC.

- Run the Change Default Database program to ensure you are correctly attached to the default database. This process is only done once when you define the default EOC to be connected to the PC.

An *"OLE 40"* error will display if the `C:\FEMIS\GLOBAL.MPT` file is not copied to `C:\WINPROJ`.

- Request the System Administrator copy the `GLOBAL.MPT` file to `C:\FEMIS`.

Calendar is not based on 24-hour clock, 7-day a week schedule.

- Recopy the `GLOBAL.MPT` from `C:\FEMIS` to `C:\WINPROJ`, which is your Microsoft Project directory.

☐ **E-Mail**

The button is grayed out. The E-mail software has not been installed or was installed after the FEMIS installation. Another possibility is the `FEMIS.INI` file does not give the correct path to the vendor-supplied software.

- Install the E-mail software (see Section2.1.4, Installing Novel GroupWise).

- Run `C:\FEMIS\FIXINI.EXE` to fix the paths to these programs.

E-mail notification does not display.

- Check to see if the user can access mail directly from the GroupWise application. If direct access did not work, the user is not valid and needs to be added to GroupWise.

☐ **FEMIS/EMIS Data Exchange Interface**

If there is no data or outdated Met information, the EMIS/FEMIS interface may not be properly installed.

- Refer to Section 8.0, FEMIS Data Exchange Interface (DEI).

☐ **General Protection Fault (GPF) and Other Errors**

When a specific window in FEMIS does not work on one machine (usually it will give a General Protection Fault [GPF] or other error), but the window works fine on other machines.

- If another software program was installed after FEMIS, it is possible that a files was overwritten that is used by FEMIS. This file may be different and an incompatible version compared to the one installed by FEMIS.
- Run the FEMISCHK program on both a machine that works and the machine that does not work to see if there are any differences. If there are differences, you can copy the changed file(s) from the machine that works to the one that does not work.

☐ **GIS Errors**

The MAP button on the FEMIS Menu Bar is grayed out. This implies either ArcView has not been installed, ArcView or other COTS were installed after the FEMIS installation, or the path provided in the `FEMIS.INI` file to access the ArcView executable is incorrect.

- Reinstall ArcView (see Section 3.1.5, Installing ArcView).
- Run `C:\FEMIS\FIXINI.EXE` to fix the paths to these programs.

ArcView runs, but it keeps asking where files are and putting up a directory window. This implies that the data provided in the FEMIS install was not properly copied to the GIS directory.

- Make sure all of the FEMIS GIS files and directories are copied down to each PC, by running the Setup GIS program (`SETUPGIS.EXE`). Contact the FEMIS Help Desk for assistance.

☐ **Menu Items Grayed Out**

If a FEMIS menu item is grayed out, it may mean many things. A user should

- Verify that a mode has been selected on the Tracking Navigator. Many FEMIS menu items are unavailable until a mode has been selected.
- Verify that the user has the appropriate privileges. If not, assign the appropriate privileges for the user.

☐ **Meteorological (Met) Data**

The contents of the window are empty, or the values are old and not changing. This implies that the Met system has not been installed, and the Met simulator is not operating; or the Met system is loading data into the wrong exercise, if you are in Exercise mode.

- See Section 7.0, FEMIS Met Application Suite to install and configure the Met system.

☐ **Notification Server Errors**

If you get an error message that states *"Orphan DLL detected"* and the FEMIS Notification Service icon (a blue circle with an exclamation mark) is not active on your desk top. There may be several reasons for this error message.

- If you started another FEMIS program before starting FEMIS, and closed that program before closing FEMIS, this error will happen. Log out and log back in.

- The Notification server is out of sync with your PC. This usually occurs after you exit FEMIS **and** immediately re-enter FEMIS. The PC did not have time to disconnect the Notification application from the socket on the server before running the FEMIS application again. Exit FEMIS. Double-click the background portion of your Windows desktop to bring up the Task List window and ensure that the Socket Message Window task has ended. If the task has ended, you should be able to rerun FEMIS without any problems.

- If you have exited FEMIS and the Notification icon is still present, double click the icon, and then close the window. The Notification task will end.

- The FEMIS Notification Service truly is corrupted and has become confused about which socket it is supposed to be connected to the PC and Sun server. This problem usually happens after you get a General Protection Fault or some other significant PC error. The easiest way to fix this is to log out and re-enter Windows. This process fixes the problem 95% of the time. As a reminder, it is always a good practice to re-enter Windows after a General Protection Fault or some other significant Windows error.

If you get an error message that states *"Unable to establish notification link with* `<your server name>` *in 10 seconds."* verify the following:

- The UNIX server may be down. Check the server and restart it, if necessary.

- The Notification server name or port number is not valid. Check the EOC table in your FEMIS database and make sure the Notification server name and port number are correct.

- Your network is down or unusually busy. Run the `FWATCH` program to verify network status. Tell FEMIS to keep trying to connect with the Notification server, or close FEMIS and try again.

- If the problem persists, the System Administrator may need to increase the `MaxSocketWait` value in your notification configuration file.

☐ **Oracle Database Errors--Unable to Connect**

If FEMIS is unable to connect to the Oracle database on a single PC, but other PCs connecting to the same server are working correctly, the problem may be with the PC or the network connection to the single PC. Try one or all of the following:

- Log out of Window and log back in. In most cases, FEMIS will now run correctly.
- Shutdown the PC, verify that the network cable is connected, and if you have the equipment, check that the network cable is "live.". Reboot and try again.
- Run the `FEMISCHK` program on both a machine that works and the machine not working to see if there are any differences. If there are differences, you can copy the changed file(s) from the machine that works to the one that does not work. The `FEMISCHK` program is located on `C:\`.
- Reinstall the FEMIS configuration files (e.g., `ODBC.INI, TNSNAMES.ORA`). Run the `Setup` program, select the `Only Configuration Files` option. Reboot and try again.
- As a last resort, completely reinstall FEMIS. Run the `Setup` program, select the Full Installation option. Reboot and try again.

If all PCs start getting Oracle errors at the same time, it is either a problem with the UNIX server, the Oracle database, the Oracle listener, or the network. Contact the FEMIS Help Desk for assistance.

☐ **PC Clock**

If you get an error *"Your clock may be configured incorrectly."* when hitting a Now button in Event Declare, Work Plan, or Status Boards, then your clock is probably not configured correctly.

- From Windows Control Panel, verify that your PC clock is setup correctly. See Section 3.1.1.3, Installing Windows NT.

☐ **Printer Problems**

GIS printouts are not readable.

- Attempt to change the default colors on the PC.
- Contact your System Administrator for assistance.

☐ **Site Defined Status Boards**

There are no names in the Status Board Name field.

- Site Defined Status Boards have not been generated.

- If you cannot select a Site Defined Status Board, verify the user has privileges set for that Status Board.

☐ Starting Up FEMIS Application Errors

If errors occur in starting up the FEMIS application, it is possible that FEMIS may not have been installed properly, or the install may have been corrupt.

- Verify that the correct executables are in the FEMIS directory. See Section 3.2, Installing the FEMIS PC Software, for a list of FEMIS executables. If executables are missing, rerun the FEMIS Setup program and select upgrade.

- Verify that the user has the necessary privileges to access the desired functionality.

☐ Sun Package Installation Errors

When installing the FEMIS package from the spool directory, it is possible to receive an error, *"Broken Pipe."*

- This error happens when the last package in the list is not selected for installation. This error will not cause any problems with the FEMIS installation. Continue with the installation.

Appendix A
FEMIS Checklist for UNIX Servers

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FEMIS Checklist for UNIX Servers

The following checklist has been provided for the purpose of monitoring the FEMIS UNIX servers during daily usage.

Use UNIX FEMIS Monitor

Use the UNIX FEMIS Monitor tool to check system and database status. The UNIX FEMIS Monitor was designed to be run continuously. It will update the system and database status periodically. To run the UNIX FEMIS Monitor tool, type the following commands.

```
% su - femis
% femismon.sh | tee -a /home/femis/log/femismon.log
```

Daily Checklist

1. Verify the file system backups (login as `root` or `***up`) were successful.

2. Monitor all available disk space. To monitor available disk space, type the following command.

   ```
   % df -k
   ```

3. Verify required processes are running.

   A. Verify that the NFS Maestro daemon is running by typing the following commands.

   ```
   % ps -ef | grep hc/nfsd
   /apps/local/bin/hc/nfsd
   ```

   B. To restart the NFS Maestro daemon, type the following:

   ```
   % su -
   # sh /etc/init.d/bwnfs stop
   # sh /etc/init.d/bwnfs start
   ```

4. Verify the FEMIS Notification Service is running.

```
% ps -ef | grep femis_event
/home/femis/bin/femis_event
```

To restart the FEMIS Notification Service, type the following:

```
% su -
# sh /etc/init.d/femis stop
# sh /etc/init.d/femis start
```

5. Verify FEMIS DEI is running (onpost only) by typing the following:

```
% ps -ef | grep femisdei
/home/femis/bin/femisdei
```

To restart FEMIS DEI enter the following:

```
% su -
# sh /etc/init.d/femis stop
# sh /etc/init.d/femis start
```

6. Verify NTP is running by typing the following:

```
% ps -ef | grep ntp
 /apps/local/bin/xntpd
```

To restart NTP type the following:

```
% su -
# sh /etc/init.d/ntp stop
# sh /etc/init.d/ntp start
```

7. Verify GroupWise is running by typing the following:

```
% ps -ef | grep grpwise
/apps/grpwise/gwdomain/wpcs/ofcs
/apps/grpwise/gwdomain/wpgate/smtp/smtp
```

To restart GroupWise type the following:

```
% su -
# sh /etc/init.d/grpwise stop
# sh /etc/init.d/grpwise start
```

8. Monitor the network by using the ping process to ensure the network is configured correctly and that the routers and communication links are reliable. Do this once a day or more frequently if database errors are occurring. Use the following command.

```
% ping -Rv -s <host name> 2000 20
```

This will show the route that a 2000 byte packet is sent and time the transfers. Do this for each remote host and from several different host. Look for non-optimal routing, long delays, and lost packets.

Non-optimal routing would be indicated by the path using a route that would add one or more extra hops or one where the outgoing route differs from the return path.

Long delays would be greater than 1000 milliseconds for the average packet transversal time.

Any packet loss greater than 15% could cause the database to generate replication errors.

9. Verify Oracle by performing the following procedures:

   A. Run the FEMIS monitor (see Section 4.0, FEMIS Monitoring Tools).

   B. Verify Oracle exports were successful. To verify exports, type the following:

```
% su - oracle
% mailx
```

   C. Check the Oracle Alert Logs by looking for any Oracle errors and check the redo log cycle rates. The redo logs should cycle every 2.5 hours, depending upon the number of user accounts found. If many database modifications occur, the rate may be faster. A longer period between cycles indicates that fast replication is not working correctly. To check the log cycle rate, type the following commands.

```
% su - oracle
% more $ORACLE_HOME/rdbms/log/alert_*.log
```

   If you are logged in on the Sun console, run the server manager in graphic mode by typing the following commands.

```
% su - oracle
% svrmgrm
```

   Once the server is in graphic mode, check the following items:

   + table space reserve. If a lot of new data has been created, some of the table spaces may overflow. If any table space is over 85% used, a new data file should be added. Please contact PNNL for assistance.

   + view snapshot logs. When replications is functioning properly, there should be seven snapshot logs for each table that is shared. If less than or more than seven logs exist, please contact PNNL for assistance.

+ view snapshot. The snapshots should be refreshed at least once per day. If the snapshot display shows a last refreshed date more than a day old, something is wrong; please contact PNNL for assistance.

10. Check the FEMIS Notification Service status. Check the status only on one server. Look at the `shownotify.aux.log` file to see if all the servers are up and connected to all the other servers. Refer to Section 5.1.3, Notification Server Utilities, for more information on interpreting the results. To check the status, enter the following commands.

```
% su - femis
% shownotify info  >& /home/femis/log/shownotify.info.log
% shownotify aux   >& /home/femis/log/shownotify.aux.log
% shownotify event >& /home/femis/log/shownotify.event.log
```

Other

After a reboot, start the swap space monitor by entering the following commands.

```
% su - femis
% cd /home/femis/log
% chkswap.sh &
```

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