HP FTAM/9000 Programmer's Guide

Edition 5

B1033-90014
HP 9000 Networking
E0597

Printed in: U.S.A.

Legal Notices

The information in this document is subject to change without notice.

Hewlett-Packard makes no warranty of any kind with regard to this manual, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose. Hewlett-Packard shall not be held liable for errors contained herein or direct, indirect, special, incidental or consequential damages in connection with the furnishing, performance, or use of this material.

Warranty. A copy of the specific warranty terms applicable to your Hewlett- Packard product and replacement parts can be obtained from your local Sales and Service Office.

Restricted Rights Legend. Use, duplication or disclosure by the U.S. Government is subject to restrictions as set forth in subparagraph (c) (1) (ii) of the Rights in Technical Data and Computer Software clause at DFARS 252.227-7013 for DOD agencies, and subparagraphs (c) (1) and (c) (2) of the Commercial Computer Software Restricted Rights clause at FAR 52.227-19 for other agencies.

HEWLETT-PACKARD COMPANY 3000 Hanover Street Palo Alto, California 94304 U.S.A.

Use of this manual and flexible disk(s) or tape cartridge(s) supplied for this pack is restricted to this product only. Additional copies of the programs may be made for security and back-up purposes only. Resale of the programs in their present form or with alterations, is expressly prohibited.

Printing History

The manual printing date and part number indicate its current edition. The printing date will change when a new edition is printed. Minor changes may be made at reprint without changing the printing date. The manual part number will change when extensive changes are made.

Manual updates may be issued between editions to correct errors or document product changes. To ensure that you receive the updated or new editions, you should subscribe to the appropriate product support service. See your HP sales representative for details.

First Edition: April 1991 (HP-UX Release 8.0)

Second Edition: November 1992 (HP-UX Release 9.0)

Third Edition: January 1995 (HP-UX Release 10.x)

Fourth Edition: March 1997 (HP-UX Release 10.10)

Fifth Edition: May 1997 (HP-UX Release 10.30)

Preface

Purpose

The purpose of the *HP FTAM/9000 Programmer's Guide* is to introduce you to the File Transfer, Access and Management (FTAM) concepts you must know to write FTAM applications. Additionally, this guide provides example programs and program fragments to illustrate the use of FTAM services.

Audience

The *HP FTAM/9000 Programmer's Guide* is for application programmers who want to learn to use FTAM and who are familiar with the C programming language.

Scope

The *HP FTAM/9000 Programmer's Guide* explains basic FTAM concepts and thoroughly explains each FTAM data structure. This guide also describes the FTAM functions and their parameters.

HP FTAM/9000 runs on HP OTS/9000, an HP network product that provides a lower-level OSI protocol “stack,” in conjunction with an 802.3 network link.

Organization

Chapter 1	**HP FTAM/9000 Overview**This chapter provides an overview of the standards on which HP based this FTAM implementation, and the general concepts you should know before writing FTAM applications. Reading the conceptual information is vital to understanding the terminology used throughout the remainder of the manual.
Chapter 2	**Using HP FTAM/9000**This chapter describes how to start and stop the FTAM system and how to use FTAM regimes, functions, parameters, and libraries. Additionally, it provides general recommendations for programming with FTAM.
Chapter 3	**HP FTAM/9000 Data Structures**This chapter describes the structures used by FTAM. Additionally, the chapter describes header files, setting bits with defined constants, and basic data types.
Chapter 4	**Using Support Functions**This chapter describes the support functions used throughout most applications. For example, some support functions help you manage memory and translate error codes to printable character strings.
Chapter 5	**Using High Level, Context Free Functions**This chapter describes high level, context free (HLCF) functions. High level means you can use one function instead of several other functions (low level). Context free means they are not dependent on the use of other functions for their success.
Chapter 6	**Managing HP FTAM/9000 Connections**This chapter describes functions used to establish and release FTAM connections.
Chapter 7	**Managing and Accessing HP FTAM/9000 Files**This chapter describes the functions used to manage and access FTAM files after you established connections.

Chapter 8	**Transferring HP FTAM/9000 Data**This chapter describes the functions used to transfer data to and from FTAM files
Chapter 9	**Handling Errors**This chapter describes troubleshooting FTAM, interpreting errors, and logging error information.
Chapter10	**Example Programs**This appendix provides complete examples of HLCF functions, creating FTAM connections, managing and accessing FTAM files, and transferring FTAM data. These programs also use the support functions throughout them.
Chapter11	**Document Types and Constraint Sets**This appendix contains describes the file representations supported by the various document types and constraint sets.
Chapter 12	**Character Sets**This appendix describes the available character sets for the HP–UX implementation of FTAM.
Glossary	The glossary defines terms used throughout the manual.
Index	The index lists information by topics so that you locate necessary information.

Documentation Guide

For More Information	**Read**
Installing and Configuring HP FTAM/9000	*Installing and Administering HP FTAM/9000* (B1033-90034)
Troubleshooting HP FTAM/9000	*OSI Troubleshooting Guide* (32070-90020)
FTAM Programming	*HP FTAM/9000 Reference Manual* (B1033-90004)

FTAM Protocol Specifications	*ISO 8571, Information Processing Systems – Open Systems Interconnection – File Transfer, Access and Management*
International Standards ISO 8571	*ISO 8571, Information Processing Systems – Open Systems Interconnection – File Transfer, Access and Management*
MAP 3.0 Interface Specifications	*MAP 3.0 Application Interface Specification*
NBS Phase III	*Implementation Agreements for Open Systems Interconnection Protocols* from the NBS Workshop for Implementors of Open Systems Interconnection
ACSE	*ISO 8649, Information Processing Systems – Open Systems Interconnection – Service Definition for the Association Control Service Element*
ASN.1	*ISO 8824, Information Processing Systems – Open Systems Interconnection – Specification of Abstract Syntax Notation One (ASN.1)*
BER	*ISO 8825, Information Processing Systems – Open Systems Interconnection – Specification of Basic Encoding Rules for Abstract Syntax Notation One (ASN.1)*

Contents

Contents

Contents

Contents

Contents

Contents

Contents

Contents

Contents

Contents

Contents

Contents

Contents

Contents

1 HP FTAM/9000 Overview

File Transfer, Access and Management (FTAM) is an international standard for transfer, access, and management of files in an open network. HP FTAM/9000 is an HP implementation of this standard; it offers the C language programmatic interface defined for MAP 3.0 FTAM, which in turn, provides you with the following capabilities.

- Multivendor connectivity
- Text and binary file transfers
- File access (record level locate and read)
- File management, including the following:
  - File creation and deletion
  - File attribute manipulation (read and change)
  - Security mechanisms such as file locking, filestore passwords, and concurrency control, and file access control

Chapter Overview

This chapter is an overview of the HP-UX implementation of FTAM. The chapter discusses both the standards on which HP FTAM/9000 is based and the high-level concepts you should know before writing FTAM applications (user programs). The major topics are as follows.

- The HP-UX Implementation of FTAM
  - Open Systems Interconnection (OSI)
  - ISO/IS 8571 FTAM
  - Manufacturing Automation Protocol (MAP) 3.0
  - Implementors Agreements
  - Protocol Implementation Conformance Statement (PICS)
- Conceptual FTAM Overview
  - Virtual Filestore (VFS)
  - Regimes
  - FTAM Communication
    - Initiators and Responders
    - Application Entities (AEs)
    - Synchronous and Asynchronous Calls
  - File Attributes
  - Document Types
    - Constraints Sets
    - Access Contexts
  - FTAM File Structure Model

The HP-UX Implementation of FTAM

The HP-UX implementation of FTAM is compliant with the following standards and specifications.

- Open Systems Interconnection (OSI) Model
- ISO/IS 8571 FTAM
- Manufacturing Automation Protocol (MAP) 3.0 Application Interface Specification
- NBS (NIST) Phase III Implementors Agreements

Additionally, HP implemented T1.3, T2.3, A1.3, and M1.3 profiles from the NBS (NIST) Phase III Implementors Agreements.

Open Systems Interconnection (OSI)

The OSI network model defines a standardized network architecture that supports connection-oriented communication between devices for all vendors. Users of an OSI network can accurately anticipate how other network nodes behave. Once a connection is established with a remote system, exchange of data is guaranteed.

The International Standards Organization (ISO) created the OSI model to define the actions and services of seven communication functions known as the seven layers. Layer seven of this model is the Application layer (the layer on which your application program sits). The interface to the Application layer describes your view of the network; FTAM resides in this seventh layer. The activities below layer seven concern the internal workings of the OSI protocols and therefore, are of little concern to an application programmer.

ISO/IS 8571 FTAM

The international standard (IS) ISO/IS 8571 defines FTAM. This standard specifies a virtual filestore, a set of services to manipulate that filestore, and a set of rules (protocols) that define how to use the services. The formal title of ISO/IS 8571 is “Information Processing Systems — Open Systems Interconnection File Transfer, Access and Management.”

Manufacturing Automation Protocol (MAP) 3.0

The Manufacturing Automation Protocol (MAP) 3.0 Specification identifies standard protocols for each of the seven OSI layers. The MAP 3.0 Application Interface Specification defines the C-language programmatic interface to each Application service, including the HP-UX FTAM service.

NBS (NIST) Implementors Agreements

The NBS (NIST) Implementors Agreements further define implementation limitations on ISO/IS 8571 FTAM. HP-UX FTAM supports the NBS Phase III minimum requirements, and implements many of the NBS options, based on perceived value and compatibility with HP-UX.

NOTE

There are a number of attributes that HP-UX FTAM does not implement. HP-UX FTAM accepts values for these options as input, but makes no local use of them. When these options are output, HP-UX FTAM provides zero (for integers) or “no value available” (for strings). For these options, this document often states that there is “no value available”” or that HP-UX FTAM responders accept, but ignore the value.

If another implementation is not NBS Phase II or Phase III compliant, you may still be able to communicate with that implementation. Refer to the vendor's Protocol Implementation Conformance Statement (PICS) to determine how to set parameters.

Protocol Implementation Conformance Statement (PICS)

The HP-UX FTAM Protocol Implementation Conformance Statement (PICS) defines the capabilities of HP-UX FTAM responders. You can use PIC Statements to determine if two implementations can communicate. Refer to the *HP FTAM/9000 Reference Manual* on how to obtain the HP-UX FTAM PICS.

HP implements the profiles A1, M1, T1, and T2. (The following references to document types, constraint sets, file access data units (FADUs), initiators, responders, and Virtual Filestore are described in the “Conceptual FTAM Overview” section.)

A1 Provides for the transferring and accessing of files with Unstructured or Flat constraint sets. FTAM-1, FTAM-2, and FTAM-3 document types are supported. A1 supports reading from and writing to a file or a single FADU, locating within files, and erasing files.

M1 Provides for an initiator's management of files within the Virtual Filestore, to which access is provided by the responder. Management includes creating and deleting a file, and reading and changing file attributes.

T1 Provides for the transferring of entire files with an Unstructured constraint set. Both FTAM-1 and FTAM-3 document types are supported. T1 supports reading from or writing to an entire file.

T2 Provides for the transferring of entire files with an Unstructured or Sequential Flat constraint set. FTAM-1, FTAM-2, and FTAM-3 document types are supported. T2 supports reading from or writing to a file or a single FADU.

Overview of FTAM Concepts

This section takes a high-level approach to explaining concepts you should know before writing FTAM applications. This section also refers to specific FTAM functions. For detailed information regarding these concepts and functions, refer to the Table of Contents for specific chapters and sections.

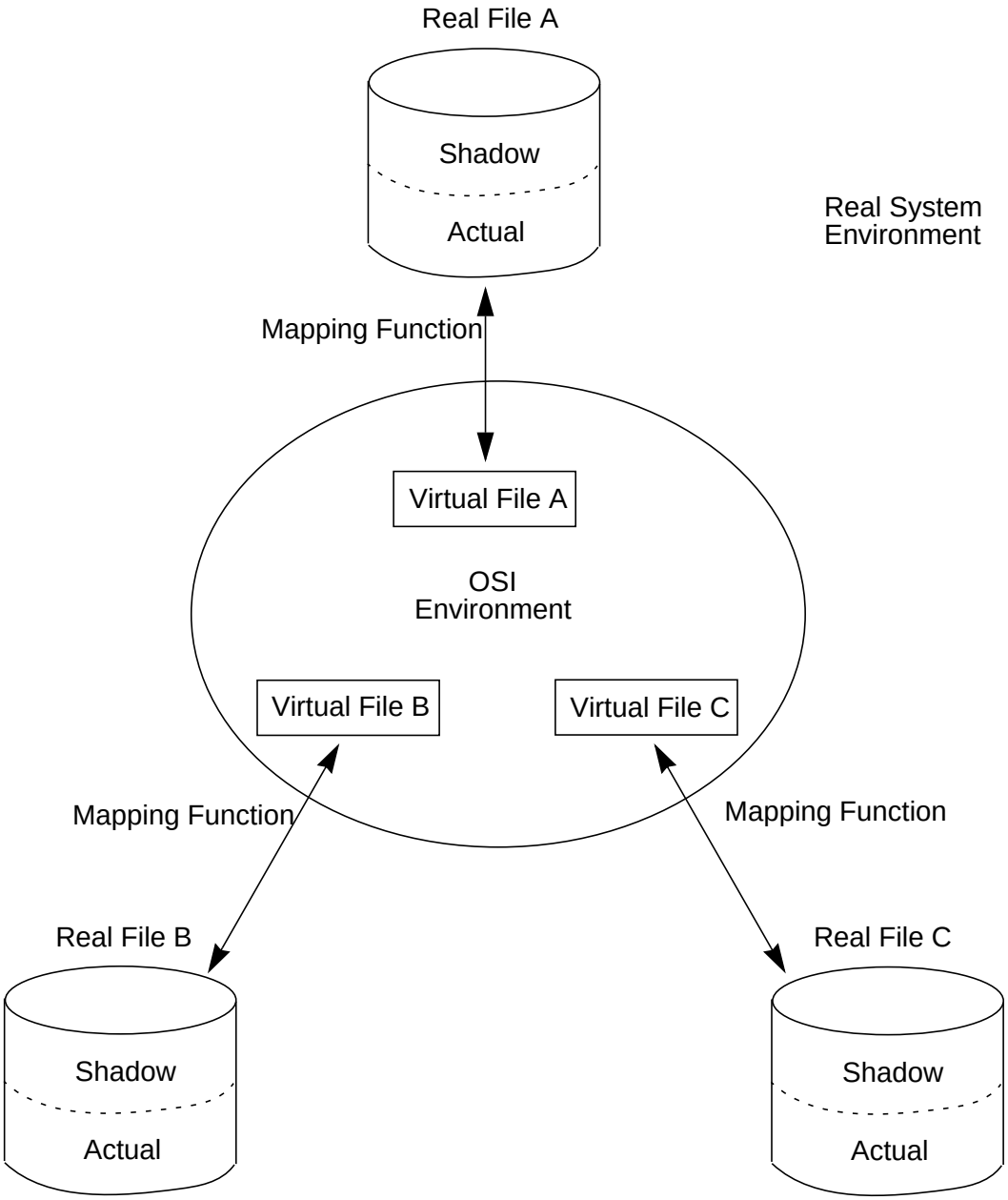
The Virtual Filestore (VFS)

A real filestore uses a variety of mechanisms to structure, store, and retrieve real files. For example, files on HP-UX systems are stored and accessed as a stream of bytes; on other systems files might be stored and accessed as fixed- or variable-length records, or in other ways.

To conceal these storage and access differences, the FTAM specification defines a **Virtual Filestore**, or **VFS**. The VFS provides a uniform interface to all real file systems. It uses a system-independent model for describing files and their attributes. Though it represents real files, it masks the system- dependent differences in style and structure. (Refer to Figure 1-1.)

FTAM implementations map the VFS onto a real filestore. The mapping function (from the open system to the real system) absorbs the style and specification differences. You do not need to know the vendor, operating system, or file system with which you want to communicate. You need only know a file's complete name and where it is located. (However, you may need to read the other vendor's PIC statement.)

Figure 1-1 HP-UX FTAM Virtual Filestore (VFS)



FTAM Shadow Files

Because the VFS is generalized, certain VFS concepts have no direct correspondence to the HP-UX file system. For example, a VFS file might have fixed-length records. Such records are not defined for the HP-UX file system.

To provide HP-UX files with FTAM VFS attributes, HP-UX uses two files: an actual file and an optional shadow file.

- The **actual file** contains the data for the file. The ownership and permissions for the file are related to, but distinct from, the FTAM attributes for the file.
- The **shadow file** contains only the FTAM VFS attributes for the file.

The actual and shadow files taken together make an "FTAM file." The shadow file for an HP-UX file has the same name as the HP-UX file, prefixed by "._". For example, the FTAM file named myfile has a corresponding shadow file named ._myfile. Like all files that begin with a period, FTAM shadow files can be listed with the following command:

```
$ ls -a
```

Certain FTAM attributes—such as document type—exist only in the shadow file. Other FTAM attributes—such as file name—are mapped to normal HP-UX file attributes. Some FTAM attributes—such as access control— include a combination of HP-UX file attributes and shadow file information.

The shadow file is not always necessary to read or delete a file. For these actions, FTAM uses default attributes. However, whenever FTAM creates or modifies a file, it always creates a corresponding shadow file.

NOTE Other FTAM products from other vendors may implement the VFS using methods other than shadow files.

Shadow File Cautions. Use caution when employing HP-UX utilities with FTAM-related files. The following examples illustrate the kinds of issues that can arise:

- If you use mv to rename or relocate an FTAM-related file, the corresponding shadow file will not be rename or relocated. Subsequent FTAM access to the file will use default VFS attributes, which may or may not apply.

- If you use cp to create a new copy of an FTAM-related file, a corresponding shadow file will not be created. Subsequent FTAM access to the copy will use default VFS attributes, which may or may not apply.
- If you use chmod or chown to change the HP-UX permissions or ownership of an FTAM-related file, the new attributes may conflict with the attributes stored in the corresponding shadow file. Subsequent FTAM access to the file may have unexpected results or cause inconsistencies.
- If you use rm to remove an FTAM-related file, the corresponding shadow file will not be removed.

Shadow files that are inadvertently severed from their corresponding actual files remain as clutter. Furthermore, they could potentially interfere with future FTAM operations on files that have the same name as the original actual file.

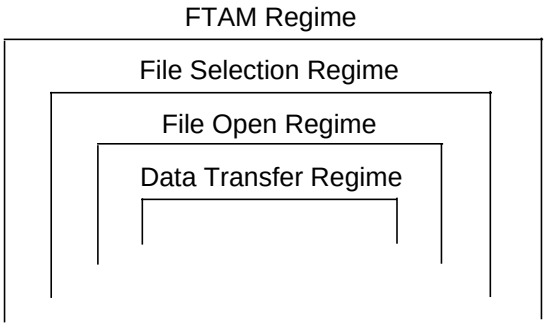
Regimes

An FTAM transaction is built by calling FTAM functions in steps (or nested state sequences) called regimes. A regime is the period during which you can issue a specific set of FTAM functions. The regime determines the activities that can occur at a given time and therefore, creates the rules (protocols) for the FTAM state machine.

Regimes are nested, in the following order. Applications must pass through outer regimes to gain access to the inner ones. They must also exit the regimes in proper order, leaving the inner regimes to gain access to the outer ones.

- FTAM Regime
- File Selection Regime
- File Open Regime
- Data Transfer Regime

Figure 1-2 FTAM Regime Order



FTAM Regime	The FTAM regime requests FTAM services for the connection. The FTAM regime, also called the FTAM Association or FTAM Initialization regime, is the outermost regime.
File Selection Regime	The File Selection regime references (selects) a specific file. You can change and read attributes during this regime.
File Open Regime	During the File Open regime, a file's contents are available for access: reading, writing, locating, and erasing.
Data Transfer Regime	The Data Transfer regime is the innermost regime; it supports the transfer of actual data.

FTAM Communication

The following sections describe the basic means of FTAM communication: initiators, responders, application entities, synchronous calls, asynchronous calls, high and low level functions, and context free and context sensitive functions.

Initiators and Responders

As noted earlier, you write a program (user program) to access the FTAM interface using a library of functions. FTAM uses the initiator to make requests and the responder to service them. (Refer to Figure 1-3.)

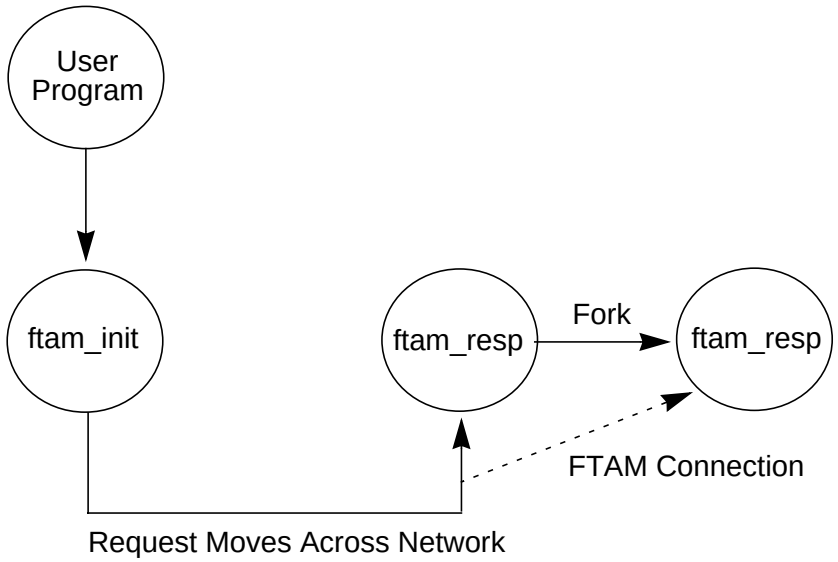
Initiator The initiator submits requests on behalf of you. When you submit a request (i.e., call a function), the initiator sends your request to a responder.

- The executable name for an HP-UX initiator is ftam_init (located in /opt/ftam/lbin). To use an FTAM function, you must link your application with the libmapftam.a library. The ftam_init process is also known as the initiator server provider process (SPP). Refer to the "Using FTAM" chapter for information on linking FTAM libraries.
- The ftam_init is invoked when you call ft_aeactivation(), and serves also as a responder for local FTAM requests. For information on ft_aeactivation(), refer to the "Managing FTAM Connections" chapter.
- The ftam_init is invoked when you call a high level function with the default ae_label (i.e., pointer to a NULL location). For information on high level functions, refer to the "Using FTAM" chapter.

Responder The responder receives and services an initiator's request. If applicable, it returns a response.

- The executable name for an HP-UX responder is ftam_resp (located in /opt/ftam/lbin). The ftam_resp is a daemon process that provides the interface for the HP-UX file system (real filestore) to the FTAM VFS. Note that the ftam_resp is also known as the responder SPP.
- One ftam_resp process exists for each active, remote FTAM connection. Connections to a local responder do not require an invocation of ftam_resp.
- An ftam_resp daemon process must be active to receive remote connection requests. After receiving a request, ftam_resp forks the process to create another ftam_resp process, which then processes all requests associated with that connection.

Figure 1-3 FTAM Communication Process



Application Entities (AEs)

An **application entity** (**AE**) is a uniquely identified component of your application that associates it with the OSI communications network. An AE may be an FTAM initiator or responder.

Before locating, accessing, or manipulating FTAM files, you must establish communication (initialize an FTAM regime) with the AE (FTAM responder) that services the desired filestore.

Identify the AE by specifying either the entity's presentation address (P_address) or its directory distinguished name (Ae_dir_name). These addresses are defined during system configuration and when nodes are added to the network. Consult your system administrator for the address information.

NOTE

Refer to the “FTAM Data Structures” chapter for information on the P_address and Dir_dn structures. Refer to the *Installing and Administering HP FTAM/9000* manual and the *OSI Troubleshooting Guide* for information on the presentation address and directory distinguished name configuration.

Once you establish the FTAM regime, you can access and manipulate FTAM files in that filestore. You can perform two types of file actions on the VFS: actions on complete files and file access actions. For example, you can create and delete a complete file or access a portion of a file's contents.

Synchronous and Asynchronous Operations

FTAM functions use two modes of operation: synchronous and asynchronous:

Synchronous Operations Synchronous function calls return only after the request is completely processed. Therefore, all output information is available when the call returns. Make synchronous function calls when the results must be processed in a specific sequence.

Asynchronous Operations Asynchronous function calls return as soon as ftam_init validates the request. Processing continues on the request. To determine whether the request returns successfully from the responder, you must call em_wait(). Output information is available only after the em_wait() function indicates that processing of the request has completed. Use asynchronous function calls when making multiple requests and when the order in which results are processed does not matter. You can perform other operations while an asynchronous request is being processed.

NOTE Refer to the “Handling Errors” chapter for information on checking for errors on synchronous and asynchronous calls. Refer to the “Using Support Functions” chapter for information on using em_wait( ).

File Attributes

An FTAM file has two distinct parts: its attributes and its contents. Attributes describe the file (e.g., size, creator), and are either file attributes or activity attributes:

File Attributes	Define the file properties that are available to all initiators. File attributes are stored with the file or created with the file. File attributes are an inherent part of the file (e.g., size). Some file attributes identify structural aspects of the file contents.
Activity Attributes	Define the properties that exist only while a specific FTAM connection is being used. These attributes are not part of the file (e.g., file_store_password).

Document Types

An FTAM document type corresponds to a file type on most systems. In real filestores, common file types include stream text files, record-oriented text files, binary files, and directories which contain files. These file types are represented by the following FTAM document types:

- FTAM-1 Unstructured, stream-oriented text files
- FTAM-2 Record-oriented text files
- FTAM-3 Unstructured, stream-oriented binary files
- INTAP-1 Record files
- NBS-9 Directories, which contain files

For more information on document types, refer to the “Document Types and Constraint Sets” chapter. For information on setting document types, refer to the “FTAM Data Structures” chapter.

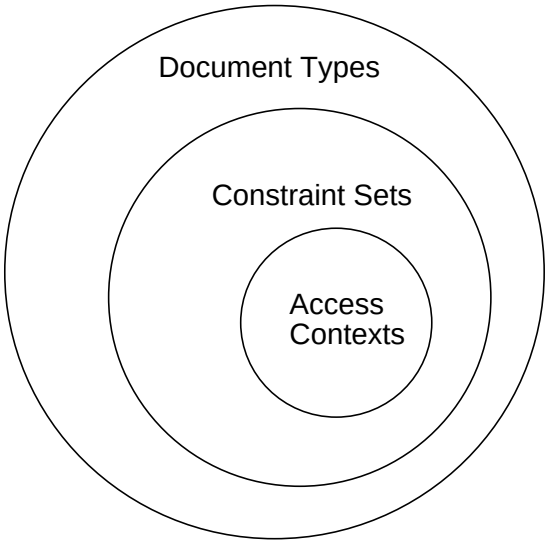
Constraint Sets

Document types restrict the type of file by specifying **constraint sets**. Constraint sets specify the allowable file structures and the ways in which access actions can modify the structure. Constraint sets are either **Unstructured** or **Sequential Flat**. (Refer to Figure 1-5 and Figure 1-6 for file structure information of these two types.) For more information on constraint sets, refer to the “Document Types and Constraint Sets” chapter.

Access Contexts

Constraint sets restrict the type of **access contexts** available. Access contexts specify how the information in the file is accessed. You specify access contexts only when reading a file.

Figure 1-4 FTAM Document Types



FTAM File Structure Model

The FTAM file model consists of a hierarchical structure (ordered tree) containing various levels.

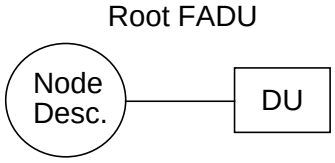
- Each node in the tree contains a **node descriptor**. Node descriptors reference specific parts of a file. However, a node descriptor may be empty.
- Each node in the tree contains a **data unit** (**DU**). This data unit contains the actual file contents.

A **file access data unit** (**FADU**) is the smallest unit you can access in an FTAM file. A FADU is the complete information content of a subtree (i.e., node descriptors and data units). FADUs may be nested and may contain several data units.

The two file structures described by the Unstructured and Sequential Flat constraint sets are identified in the following illustrations.

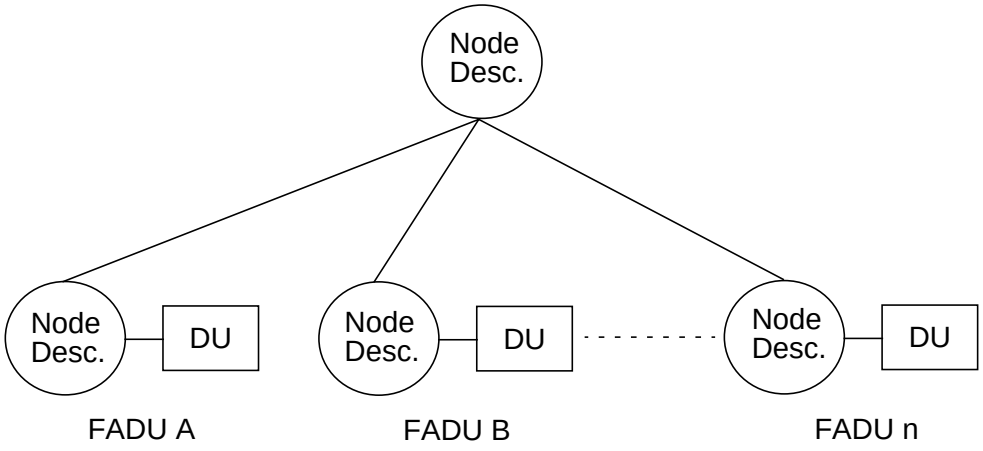
- An Unstructured constraint set contains one FADU consisting of one node descriptor and one data unit.

Figure 1-5 FADU Defined by Unstructured Constraint Set



- A Sequential Flat constraint set contains a root FADU with an unlimited number of FADUs one level beneath it.

Figure 1-6 FADU Defined by Sequential Flat Constraint Set



2 Using HP FTAM/9000

Before writing HP FTAM/9000 applications, you should understand FTAM libraries, regimes, functions, and parameters.

Chapter Overview

This chapter describes how to start and stop FTAM and explains information you should know before writing applications. The primary sections are as follows.

- Starting and Stopping the FTAM System
- Generating FTAM Programs
- Using Regimes
- Using Functions
- Using Parameters
- General Recommendations

NOTE This chapter refers to specific functions. For detailed information on a function, refer to the Table of Contents for the correct chapter.

Starting and Stopping the FTAM System

The HP OSI Transport Services (OTS/9000) startup procedure automatically starts the ftam_resp daemon (HP FTAM responder). You may occasionally need to start or stop only the FTAM portion of the system.

NOTE

Bringing down the FTAM portion of the HP OSI network system is destructive and abruptly terminates any activity using the VFS associated with the local responder.

Using the shutdown option of ftam_resp does not kill user programs or ftam_init processes, though they will encounter unexpected errors when you bring down the system. You must be superuser to shutdown the FTAM responder, as follows.

```
$ /opt/ftam/lbin/ftam_resp -shutdown
```

To re-start only the FTAM portion of the HP OSI network system, first ensure the system is running. Also, execute the ps(1) command to ensure that no FTAM responder daemons (ftam_resp) are running; if they are, execute the above shutdown command. You must be superuser to re-start ftam_resp, as follows.

```
$  /opt/ftam/lbin/ftam_resp
```

Generating FTAM Programs

Before using FTAM, you must include header files and link your programs with the libmapftam.a and libmap.a libraries. Another important library is the lint(1) library used for detecting bugs.

Header Files

In your *.c files (source files), you must have the following lines at the beginning of your program to include the appropriate header files.

```
#include %</opt/ftam/include/map.h>
#include %</opt/ftam/include/mapftam.h>
```

libmapftam.a Library

To access FTAM services, link your application programs with the libmapftam.a library. Compile your programs by executing the following command. For information on using the cc command, refer to cc(1) in the HP-UX Reference Pages.

```
cc [options] -o %<executable> %<files to compile> -lmapftam -lmap -lntl [additional
libraries]
```

lint(1) Library

A lint(1) library is available for use with the HP-UX programmatic interface to FTAM. Using lint(1) saves time by eliminating costly debugging effort. Although lint(1) does not detect all bugs, it can find some that general testing may not detect. To invoke lint(1), enter the following command.

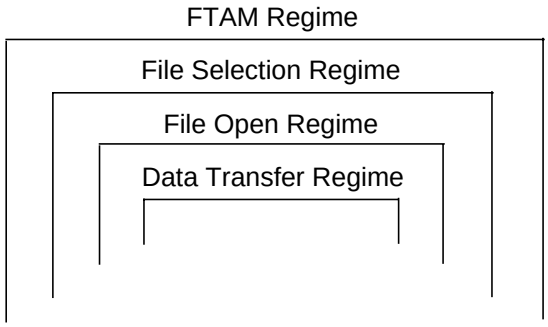
```
$ lint -ux filename.c -lmapftam -lmap
```

The -ux flags are optional; they remove some unnecessary errors about variables that are used, but not defined or some errors that are defined, but not used. For more information, refer to lint(1) in the HP-UX Reference Pages.

Using Regimes

Regimes define which functions an FTAM application can use at any time. As an application descends the regimes, you can use specific FTAM functions as described in the following figure and sections. The regime order is as follows.

Figure 2-1 FTAM Regime Order



- FTAM Regime
- File Selection Regime
- File Open Regime
- Data Transfer Regime

If you use high-level FTAM functions, you do not need to deal with regimes; FTAM takes care of these details.

Regime Guidelines

Refer to the following guidelines for working in regimes.

- You must enter the outer regimes before entering the inner regimes. For example, you must enter the File Open regime before entering the Data Transfer regime.
- You must exit inner regimes before you can exit outer regimes. For example, you must exit the File Open regime before exiting the File Selection regime.

- After exiting an inner regime, you can re-enter the same regime (e.g., you can sequentially select several files in the FTAM regime).
- You can terminate all regimes, no matter how deeply nested, using the abort request (ft_abort()).

Using the FTAM Regime

The FTAM functions requested during this regime are negotiated between the initiator and responder during the protocol exchange. (The initiator supplies information which the responder then verifies.)

Your FTAM application must supply the initiator identity. You may also request (i.e., try to negotiate) certain document types (file types), attribute groups, service classes, and functional units. Refer to the "FTAM Data Structures" chapter for detailed information regarding these negotiated services.

Document Types	File types FTAM-1, FTAM-2, FTAM-3, INTAP-1, and NBS-9. FTAM-1 is a text file, FTAM-2 is a record-oriented text file, FTAM-3 is a binary file, INTAP-1 is a record- oriented binary file, and NBS-9 is a directory.
Attribute Groups	Organize specific qualities or characteristics to a file (e.g., name and size); identify subsets of attributes.
Service Classes	Organize functional units into meaningful groups. Each service class identifies mandatory and optional functional units.
Functional Units	Specify which FTAM functions, within the selected service class, are allowed. The mandatory and optional functional units depend on the service class, which must support all selected functional unit values.

The responder verifies requests in one of the following ways.

- Returns a positive confirmation that it accepts the request with no changes.

- On ft_connect(), returns a positive confirmation that it accepts the request with the given (returned) changes to the initiator's request.
- Returns a negative confirmation that it does not accept the request.

Entering the FTAM Regime	Functions Used Within the FTAM Regime	Exiting the FTAM Regime
Invoke ft_connect() to establish a connection	ft_select() moves you to the File Selection regime and selects a file ft_create() moves you to the File Selection regime and creates, then selects a file	Invoke ft_rrequest() to release the connection and move you out of the FTAM regime. (Note: You will no longer be in a regime, but ftam_init will still be activated.)

Using the File Selection Regime

Enter the File Selection regime to reference a specific file. You must specify a filename. You cannot access a file's contents in the File Selection regime; you must enter the File Open regime to do so.

Entering the File Selection Regime	Functions Used Within the File Selection Regime	Exiting the File Selection Regime
Invoke ft_create() to create a new file **OR** Invoke ft_select() to select an existing file	ft_rattributes() reads file attributes ft_cattributes () changes file attributes ft_open() moves you to the File Open regime and opens a file	Invoke ft_delete() to move to the FTAM regime and permanently remove the file **OR** Invoke ft_deselect() to move back to the FTAM regime and deselect (but not remove) the file

Using the File Open Regime

The File Open regime makes the file's contents available for reading and writing.

Entering the File Open Regime	Functions Used Within the File Open Regime	Exiting the File Open Regime
Invoke ft_open() to access a file's contents	ft_locate() locates a specific place (FADU) in a file (FTAM-2 files only) ft_erase() completely erases an entire file ft_read() enters the Data Transfer regime and requests data transfer from an FTAM file ft_write() enters the Data Transfer regime and requests data transfer to an FTAM file	Invoke ft_close() to move back to the File Selection regime and close the file to further access

Using the Data Transfer Regime

The Data Transfer regime is the innermost regime; it supports the transfer of actual data.

Entering the Data Transfer Regime	Functions Used Within the Data Transfer Regime	Exiting the Data Transfer Regime
Invoke ft_read() to request the transfer of data from an FTAM file **OR** Invoke ft_write() to request the transfer of data to an FTAM file	ft_sdata() sends (writes) data ft_rdata() receives (reads) data ft_edata() ends the sending of data	Invoke ft_etransfer() to move back to the File Open regime and end data transfer **OR** Invoke ft_cancel() to move back to the File Open regime and cancel the transfer of data **OR** If you have received a cancellation indication, invoke ft_rcancel() to acknowledge the indication and move back to the File Open regime

Using Functions

FTAM functions may be high level or low level and may be context free or context sensitive. Refer to the following sections for information on these function types and for a list of available functions.

High Level Services (HLS) and Low Level Services (LLS)

FTAM functions are either a high level service (HLS) or a low level service (LLS). Both HLS and LLS perform the following operations.

- Ensure the input and output data are provided
- Ensure all mandatory parameters have valid values
- Ensure all optionally supplied parameters have valid values
- Provide both synchronous and asynchronous calling modes

Low Level Service	An LLS is a function that provides the lowest level of service for the FTAM application interface.
High Level Service	An HLS is a function that performs a sequence of LLS functions, thereby eliminating the need to make the LLS calls individually. For example, the HLS ft_fcopy() copies one file to another by performing all the necessary steps to do so. The ft_fcopy() function establishes connections with the source and destination nodes, opens and closes the file, reads and writes data, and terminates the regimes.

Context Free (CF) and Context Sensitive (CS) Functions

The term context refers to a dependency on the use of other functions.

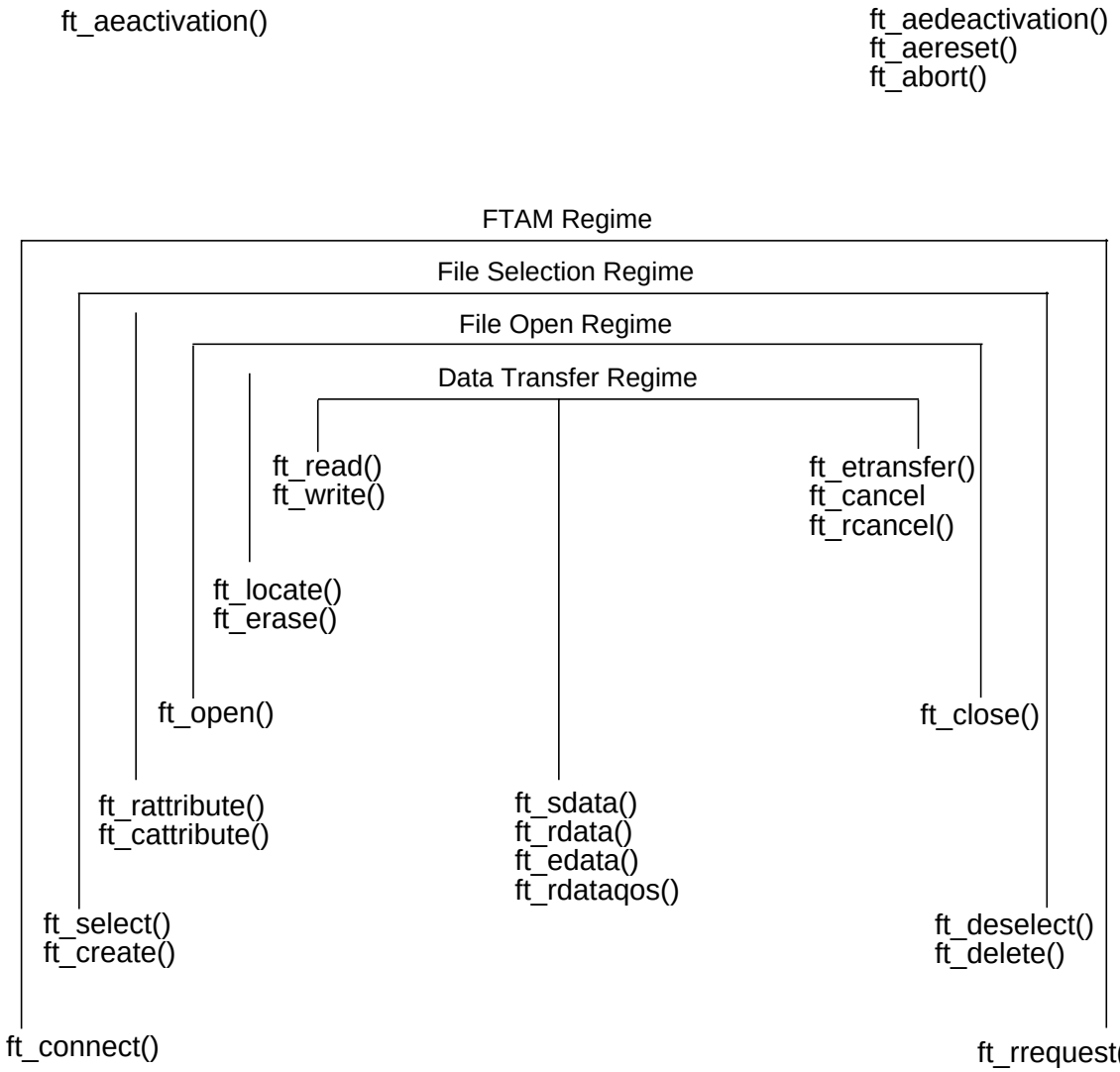
Context Free	A function that is context free does not depend on prior use of other FTAM functions. You can call a context free function at any time. All context free functions are high level services: ft_fcopy(), ft_fmove(), ft_frattributes(), ft_fcattributes(), and ft_fdelete().
Context Sensitive	A function that is context sensitive depends on prior use of other FTAM functions. You must call context sensitive functions in the correct sequence as defined by the FTAM protocol. All context sensitive functions are low level services except for ft_fopen() and ft_fclose().

Available Functions

Figure 2-2 shows the low level FTAM functions available per regime. For example, you call ft_select() or ft_create() in the FTAM regime to move to the File Selection regime, where you can call ft_rattributes(), ft_cattributes(), and ft_open(). To move out of the File Selection regime, you call ft_deselect() or ft_delete().

Note that you do not have to be in a regime to call those functions shown outside the regimes.

Figure 2-2 Available FTAM Functions Per Regime



The following table briefly describes the FTAM functions.

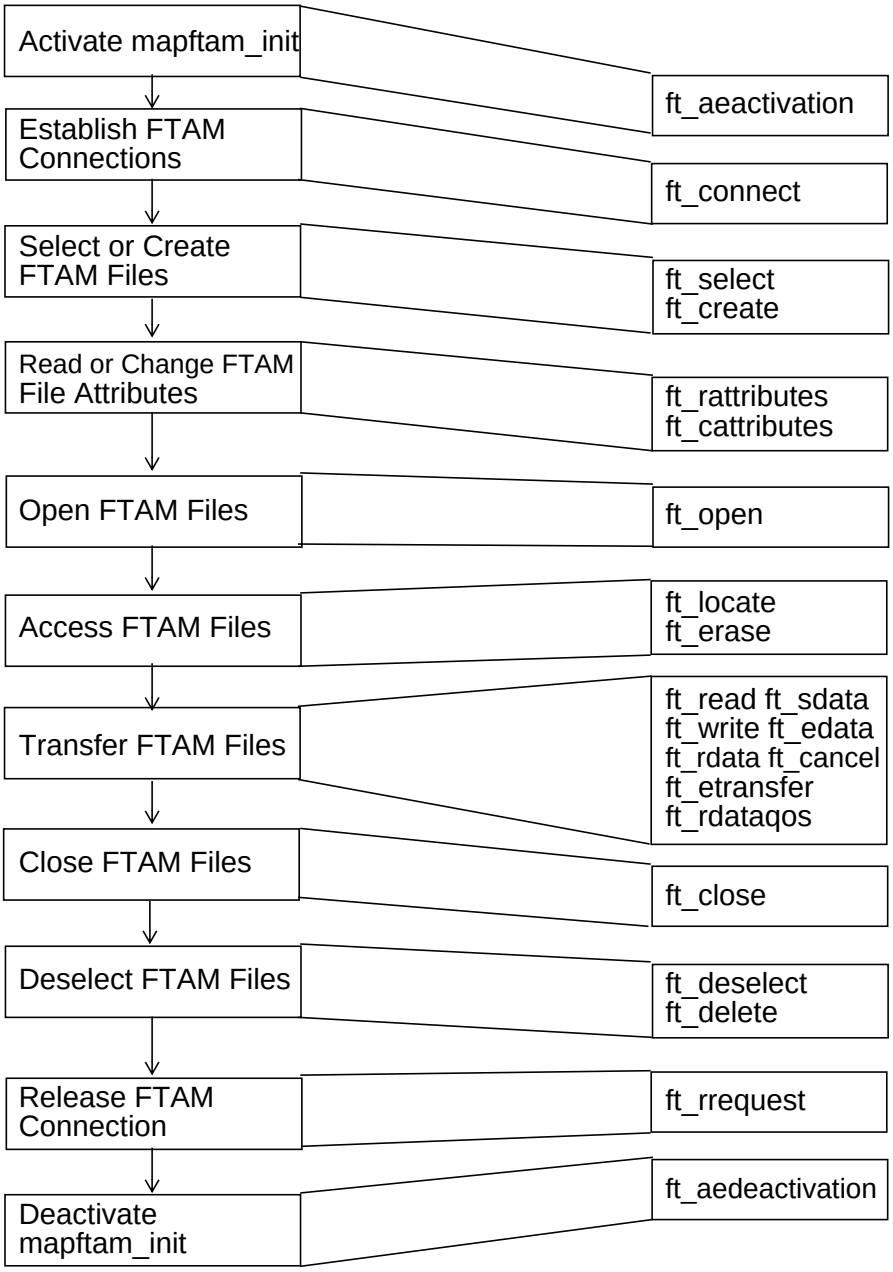
Function	Description
em_fdmemory()	Free dynamic memory allocated by em_gperror()
em_ gperror()	Translate em_fdmemory(), em_ gperror(), and em_wait() errors (return_codes) to character strings
em_wait()	Notify you that an asynchronous call completed
ft_abort()	Abort a connection Low level, context sensitive
ft_aeactivation()	Activate ftam_init Low level, context free
ft_aedeactivation()	Deactivate ftam_init Low level, context sensitive
ft_aereset()	Reset ftam_init Low level, context sensitive
ft_bgroup()	Designate the beginning of a grouped set of functions Low level, context sensitive
ft_cancel()	Cancel data transfer in progress Low level, context sensitive
ft_cattributes()	Change file attributes Low level, context sensitive
ft_close()	Close a file Low level, context sensitive
ft_connect()	Establish a connection from ftam_init to a responder Low level, context sensitive

Function	Description
ft_create()	Create a file Low level, context sensitive
ft_delete()	Delete the currently selected file Low level, context sensitive
ft_deselect()	Deselect the currently selected file Low level, context sensitive
ft_dfdcb()	Dynamically free FTAM data control block Context sensitive
ft_didcb()	Dynamically initialize FTAM data control block Context free
ft_edata()	End a series of data units Low level, context sensitive
ft_egroup()	Designate the end of a set of grouped functions Low level, context sensitive
ft_erase()	Erase all or part of a file Low level, context sensitive
ft_etransfer()	End the transfer of data Low level, context sensitive
ft_fcattributes()	Select and change file attributes, and then deselect the file High level, context free
ft_fcattributes_aet()	Select and change file attributes, and then deselect the file High level, context free
ft_fclose()	Close and then deselect or delete a file High level, context sensitive
ft_fcopy()	Copy a file High level, context free
ft_fcopy_aet()	Copy a file High level, context free

Function	Description
ft_fdelete()	Select and delete a file High level, context free
ft_fdelete_aet()	Select and delete a file High level, context free
ft_fdmemory()	Free dynamic memory allocated by ft_gperror() Low level, context sensitive
ft_fmove()	Move a file High level, context free
ft_fmove_aet()	Move a file High level, context free
ft_fopen()	Select or create a file, and then open it High level, context sensitive
ft_frattributes()	Select and read file attributes, and then deselect the file High level, context free
ft_frattributes_aet()	Select and read file attributes, and then deselect the file High level, context free
ft_gperror()	Translate returned FTAM error codes to character strings Low level, context sensitive
ft_ireceive()	Receive an abort indication Low level, context sensitive
ft_locate()	Locate a specific part of an FTAM-2 file Low level, context sensitive
ft_nwcleared()	Note when an outstanding resource is cleared Low level, context sensitive
ft_open()	Open a file Low level, context sensitive
ft_rattributes()	Read file attributes Low level, context sensitive

Function	Description
ft_rcancel()	Either acknowledge the end of a data transfer in progress **OR** Respond to a cancel indication Low level, context sensitive
ft_rdata()	Receive a block of data Low level, context sensitive
ft_rdataqos()	Request transfer of data from a file Low level, context sensitive
ft_read()	Request transfer of data from a file Low level, context sensitive
ft_rrequest()	Release a connection Low level, context sensitive
ft_sdata()	Send a block of data Low level, context sensitive
ft_select()	Select a file Low level, context sensitive
ft_write()	Request transfer of data to a file Low level, context sensitive

Figure 2-3 Example Use of Low Level FTAM Functions



Typical Applications

Figure 2-3 on the previous page is an example series of low level FTAM functions used within an application.

- The first column contains major segments (tasks) of a typical FTAM application.
- The second column contains typical low level functions used to perform the application tasks. You will probably not use all the functions in each box for every application.

Using Parameters

This section discusses parameters to FTAM functions, focussing on the input_dcb and inout_dcb parameters. For information on specific parameters, determine the function using the parameter; then use the Table of Contents to locate the chapter explaining that function.

Parameters are the mechanisms for exchanging information between your application and the FTAM interface. Parameters may be any of the following types:

- Mandatory or Optional
- Input to the function, Output from the function
- Exposed (in the function's parameter list) or Internal (as a component of a data structure called a DCB in the parameter list)

Parameter Order

Parameters to FTAM functions are organized as follows:

- Input parameters precede output parameters.
- Exposed input parameters precede input DCB parameters.
- Exposed output parameters follow output DCB parameters.

NOTE

Exposed parameters take precedence over the input_dcb parameters. For example, if you specify both the exposed parameter filename and the input_dcb->attributes.values.filename on the ft_select() function, the exposed filename is the one used to select the file.

Data Control Blocks

Data control blocks (DCBs) are C structures used as function parameters to pass information between your application and the FTAM interface.

input_dcb	Contains only function input parameters.
inout_dcb	Contains parameters used for both input and output, and parameters used for output only.

Most FTAM functions use both an input_dcb and an inout_dcb.

input_dcb

The values used within input_dcb depend on the function requirements. If any of the input_dcb parameters are mandatory, you must pass a non-NULL address of an input_dcb; otherwise, you can pass a NULL value.

You can allocate memory for the input_dcb two ways.

- Allocate the memory yourself (e.g., using malloc() or by using variables).
- Before the request, invoke ft_didcb() to allocate memory for input_dcb. After the request completes, invoke ft_dfdcb() to free the memory used by input_dcb.

After the function call returns, you can immediately reclaim or reuse memory occupied by input_dcb.

inout_dcb

Use the inout_dcb to obtain output information in the user program. When passing the inout_dcb to the interface, you must pass an address that references either a non-NULL or NULL value.

Except for size, all parameters in the inout_dcb are output parameters. Note, however, some output parameters are exposed rather than being part of the inout_dcb (e.g., connection_id on the ft_connect() function call).

The size and result fields are always present in the inout_dcb. Other inout_dcb fields may be present, depending on the function.

For asynchronous calls, you should not access the inout_dcb memory from the time the asynchronous call returns SUCCESS until em_wait() verifies completion of the request; otherwise, the memory occupied by the inout_dcb contains random data.

You can allocate memory for inout_dcb in three ways.

1. The recommended method is to have the inout_dcb address reference a NULL value when first making the call.
   - By doing so, the FTAM interface allocates the memory necessary; thus, you avoid having to anticipate how much memory is required.
   - After the FTAM function returns (for asynchronous calls, after em_wait() returns SUCCESS), you must call ft_dfdcb() to free the memory.

NOTE

The next two methods described require you to manually allocate memory, and they carry some risk. It can be hard to predict how much memory to allocate, and failure to allocate enough can cause a run-time error. Consequently, HP encourages programmers to allow the FTAM interface to allocate DCB memory. Use one of these last two methods only if you have high performance requirements that are seriously compromised by the allocation and deallocation time in the first method.

2. Allocate the memory yourself (e.g., using malloc() or using variables). *Ensure the size is large enough to hold the inout_dcb structure and all data it may reference.* This memory should include a diagnostic list that may contain from 0 to 12 elements. You can then pass the address of the allocated space to the interface.
3. Before the request, invoke ft_didcb() to allocate memory for inout_dcb. Ensure the additional_size parameter is large enough to hold the inout_dcb structure and all data it may reference. After em_wait() returns SUCCESS, invoke ft_dfdcb() to free the memory used by inout_dcb.

General Recommendations

Observe the following recommendations for programming with FTAM:

- FTAM functions are not re-entrant. Do not call any FTAM function within a signal handler.
- The inout_dcb pointer should reference a NULL value on input. This way, you do not have to anticipate the necessary output memory; the FTAM interface will allocate it for you. (Remember to later free the memory using ft_dfdcb().)
- You are guaranteed a minimum of 10 local to local (i.e., loopback) connections. You might have a maximum of 50 local to local connections, depending on the packet sizes.
- To make troubleshooting easier, always check for errors and record the following information:
  - Loop counters and other program-state information.
  - Specific function call that failed
  - Input parameters passed to the function
  - Function return value
  - inout_dcb->result.return_code
  - inout_dcb->result.vendor_code
  - Log instance (upper 16 bits of vendor_code)
  - inout_dcb->diagnostic.error_id
  - inout_dcb->diagnostic.further_details
  - return_string and vendor_string (from ft_gperror() or em_gperror())

Handling Strings, HP-UX Lines, and FTAM-1 Lines

NOTE

This section applies to FTAM-1 files only and to strings as they are used within low level FTAM calls.

This section clarifies the meaning of a **string**, **HP-UX line**, and **FTAM-1 line**. When transferring data with low level calls, you must understand FTAM-1 lines. If you are reading or writing local HP-UX files using low level calls, you must understand how to convert between HP-UX lines and FTAM lines.

String	A string is data within or pointed to by the primitive field of type struct Ft_data_element. A string may contain multiple or partial FTAM lines.
HP-UX Line	HP-UX lines are terminated by LINE FEED %<LF> characters (%<LF> is '\n' or '\012').
FTAM-1 Line	FTAM-1 lines are terminated by a combination of CARRIAGE-RETURN/LINE-FEED %<CR,LF> ('%<CR> is \r' or '\015').

Since HP-UX uses %<LF> to represent new lines, you must convert each %<LF> to the combination %<CR,LF> when writing to FTAM-1 files. For example, if your application reads an HP-UX file and subsequently sends the data as an FTAM-1 file (using low level FTAM calls), you must convert all instances of %<LF> in the data to %<CR,LF> before sending it.

- Any FTAM data element you receive uses %<CR,LF> to indicate a new line. Consequently, to write such data to an HP-UX file without using FTAM, you must write a %<LF> for every %<CR,LF> combination.
- Any FTAM data element you send must use %<CR,LF> to indicate a new line. A single %<LF> character is treated as data.

If you did not receive data directly from an FTAM function call and if you are using FTAM low level calls (e.g., ft_sdata()), you must insert %<CR,LF> characters to delimit lines; you will receive them back in ft_rdata() output.

3 HP FTAM/9000 Data Structures

HP FTAM/9000 functions use data structures to handle information consistently and to pass information between cooperating applications.

NOTE Your understanding of FTAM data structures is vital to your success in creating FTAM applications.

Chapter Overview

This chapter describes the structures used for Directory Services, Event Management functions (e.g., em_wait(), em_gperror(), and em_fdmemory()), and FTAM. Additionally, the chapter describes header files, setting bits with defined constants, and basic data types.

Header Files

Two header files, map.h and mapftam.h, contain the necessary FTAM structures, constants, and type definitions. Complete header files are available online in /opt/ftam/include.

map.h	This header file contains definitions for the constants and structures shared by MAP-based OSI services and those used the Event Management functions em_wait(), em_fdmemory(), and em_gperror(). To communicate with remote systems, you must use the map.h structures to specify either directory distinguished names (Ae_dir_name) or presentation addresses (P_address). Refer to the Directory Services section for structure information.
mapftam.h	This header file contains the definitions for constants, structures, and enumerations specific to FTAM.

Using Defined Constants To Set Bits

Certain structures require that you use defined constants to set bits to request specific items like attributes, actions, and concurrency control. You request an item by setting a bit to ON (1). Refer to the following table for a list of defined constants and their corresponding structures.

Defined Constants	Corresponding Structures
FT_FA_XXX	Ft_file_actions
FT_AG_XXX	Ft_attribute_ groups
FT_AN_XXX	Ft_attribute_names
FT_AC_XXX	Ft_access_control_element
FT_PA_XXX	Ft_permitted_actions
FT_FT_XXX	Ft_functional_units
FT_PM_XXX	Ft_processing_mode
FT_SC_XXX	Ft_service_class

- Use the defined constant to set the bits to either ON (1) or OFF (0). Setting bits other than those listed results in an error.
- If needed, set the bit by first defining a variable. Use the appropriate defined constant to set the bit you want.

EXAMPLE

This example sets the filename and contents_type attributes in the variable called attribute_names.

```
Ft_attribute_names      attribute_names;
attribute_names = (FT_AN_FILENAME | FT_AN_CONTENT_TYPE);
```

Basic Data Types

The FTAM interface uses the following data types. These basic types are unambiguous typedef synonyms for well-known intrinsic C data types.

Data Type	Description	Corresponding C Data Type
Uint8	8-bit unsigned integer	unsigned character
Unit16	16-bit unsigned integer	unsigned character
Uint32	32-bit unsigned integer	unsigned long
Sint8	8-bit signed integer	char
Sint16	16-bit signed integer	short
Sint32	32-bit signed integer	long
Bool	Logical binary	unsigned character
Octet	8 bits of unformatted data	unsigned character

Object_id

```
struct Object_id
{
    Uint16      length;
    Sint32      *element;  /* List of integers */
};
```

The Object_id is a widely used map.h structure containing the following fields.

length	Number of integers in the *element array.
*element	Pointer to an array of integers.

Octet_string

```
struct Octet_string
{
    Uint32          length;
    Octet_pointer   pointer;  /* List of Octets */
};
```

The Octet_string is a widely used map.h structure containing the following fields.

length	Number of Octets in the pointer array.
pointer	Pointer to a array of Octets.

Directory Services Data Structures

Directory Services holds and provides access to information about objects (generally existing in telecommunications and information processing). Directory Services stores information in an area collectively known as the Directory Information Base (DIB).

FTAM uses Directory Services to identify responders. One analogy is that Directory Services is like a telephone directory that lists responders.

For communicating with other systems and processes, you need to know how to identify yourself and the systems and processes with which you want to communicate. FTAM uses Directory Services to obtain the presentation addresses (called_presentation_address) for such identification purposes. To obtain these addresses, Directory Services uses the directory distinguished names (called_dir_name, source_dirname, destination_dirname, and dirname) that you provide.

For information on configuring your directory distinguished names and presentation addresses for the OTS/9000 IEEE 802.3 link, refer to the *OSI Troubleshooting Guide*.

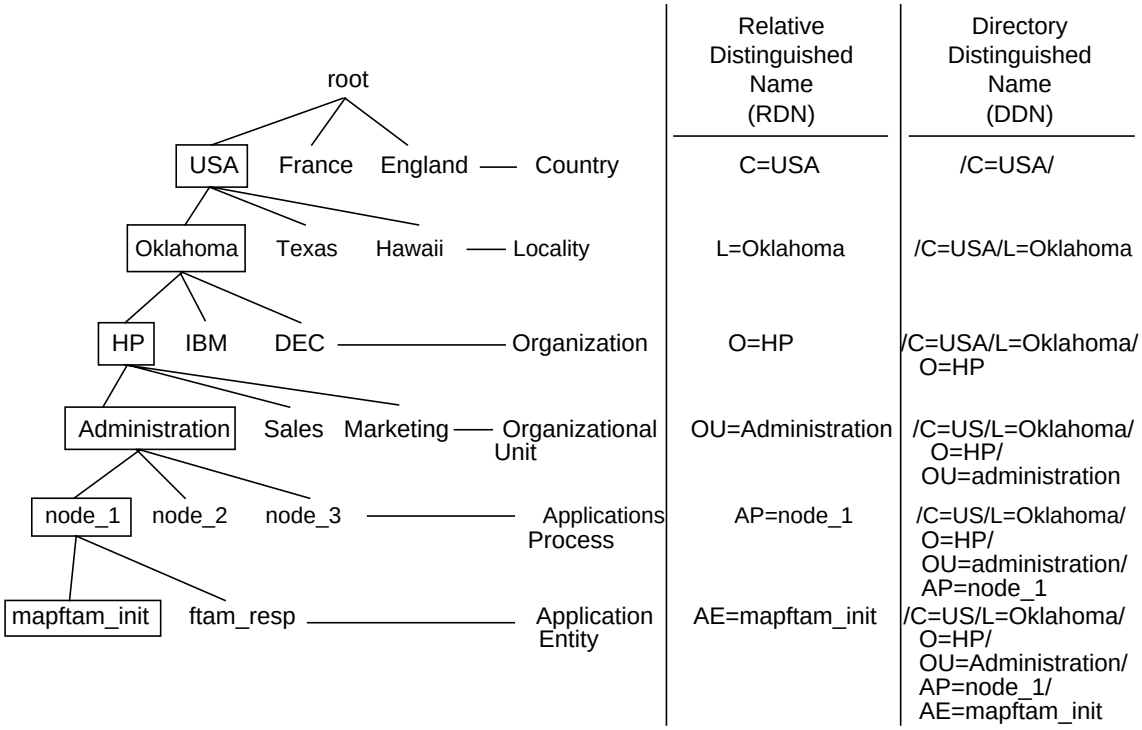
Organizing Directory Services

The Directory Service organization starts at a root entry that is the base for all entries. The following list provides possible entries in the required order.

- Country
- Locality
- Organization
- Organizational Unit
- Application Process (AP)
- Application Entity (AE)

Figure 3-1 depicts one possible organizational structure of Directory Services.

Figure 3-1 Example Directory Services (X.500) Structure



Using Directory Services

FTAM uses Directory Services whenever you call ft_connect() or high level calls to specify your directory or the directory with which you want to communicate.

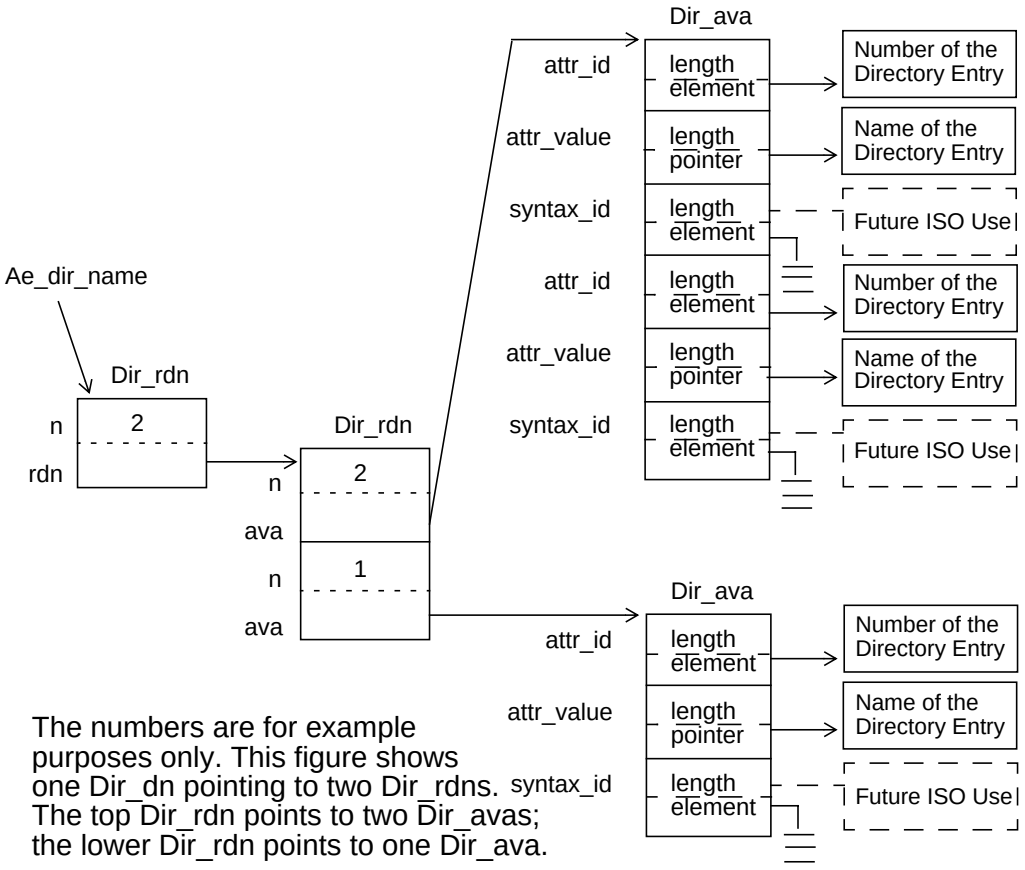
Function	Parameter	Identifies
ft_connect()	called_dir_name	Directory distinguished name of the responder process to which you want to connect
ft_fcopy() and ft_fmove()	source_dirname	Directory distinguished name specifying the source filestore
	destination_dirname	Directory distinguished name specifying the destination filestore
ft_fcattributes() ft_frattributes() ft_fdelete()	dirname	Directory distinguished name of the responder process from which you want to change or read attributes, or delete a file

Ae_dir_name

```
typedef Dir_dn          *Ae_dir_name;
```

Ae_dir_name is the primary structure for setting the directory distinguished name when calling ft_connect(), ft_aeactivation(), and all high level, context free (HLCF) functions. The embedded structures are Dir_dn, Dir_rdn, and Dir_ava (Figure 3-2). To have the system automatically set the Ae_dir_name structure, call convert_ddn; the source is in /opt/ftam/demos/cnvrt_addr.c.

Figure 3-2 Ae_dir_name Structure



The numbers are for example purposes only. This figure shows one Dir_dn pointing to two Dir_rdns. The top Dir_rdn points to two Dir_avas; the lower Dir_rdn points to one Dir_ava.

Dir_dn

```
typedef struct Dir_dn /* Directory Distinguished name */
{
  Sint8      n;                  /*No. of relative dist. names */
  struct     Dir_rdn     *rdn;   /*Ptr to a sequence of Dir_rdn */
} Dir_dn;
```

Dir_dn identifies the directory distinguished name.

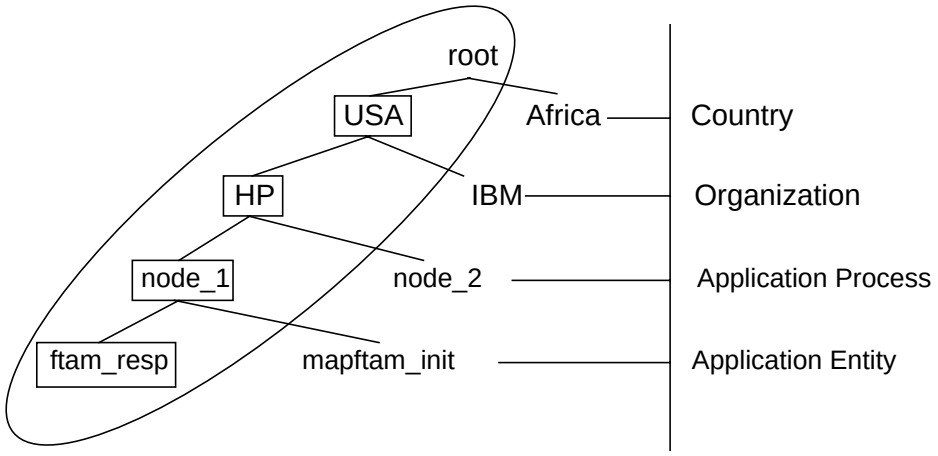
- The first field (n) is the number of relative distinguished names (rdn).
- The rdn field points to an array of Dir_rdn structures containing attribute value assertions (avas).
- The embedded structures are Dir_rdn and Dir_ava.
- Each Dir_dn that specifies an application entity (AE) has a corresponding P_address stored in the ICS, which provides the mapping between the two.
- The Dir_dn must be exactly the same as the one set during configuration.

EXAMPLE

In this example, the directory distinguished name for the ftam_resp is as follows. Each portion of the name is an rdn (e.g., O=HP).

```
/C=US/O=HP/AP=node_1/AE=ftam_resp
```

Figure 3-3 Example Directory Distinguished Name Structure



Dir_rdn

```
typedef struct Dir_rdn    /* Relative distinguished names */
{
    Sint8     n;                    /*Number of avas */
    struct    Dir_ava     *avas;
} Dir_rdn;
```

Dir_rdn identifies the relative distinguished name (Figure 3-4).

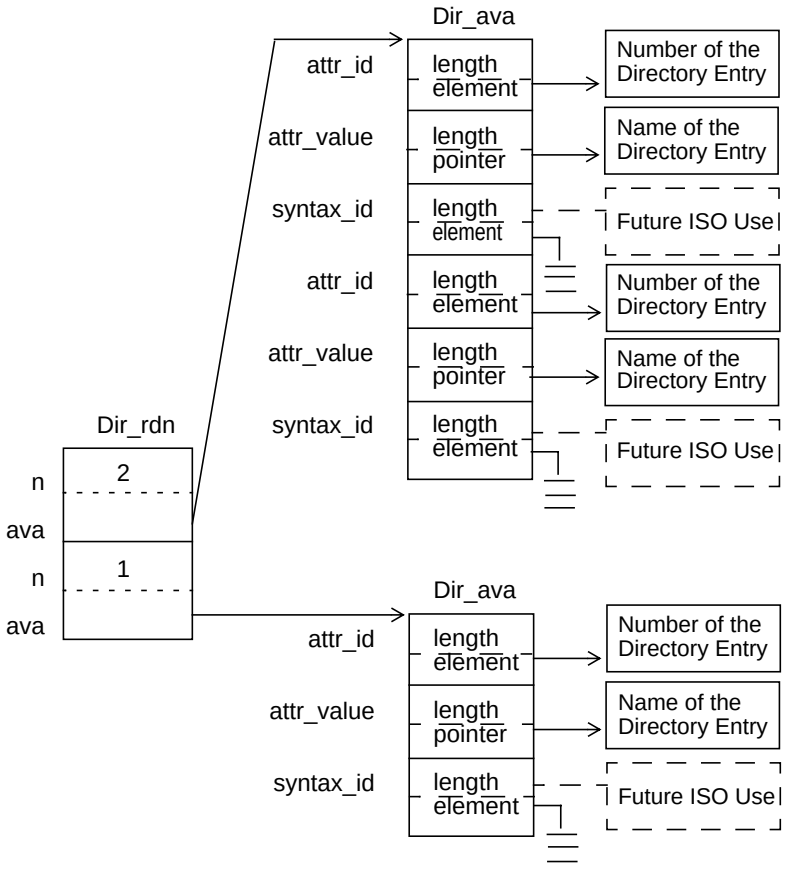
- Each rdn is part of the directory distinguished name. Refer to the following example.
- The first field (n) is the number of attribute value assertions (avas).
- Each avas points to a Dir_ava structure containing attr_id, attr_value, and syntax_id.

EXAMPLE

This example depicts five rdns: three rdns contain one avas each, and one rdn (OU) contains two avas.

```
/C=us/O=hp/L=ca/OU=falc/OU=hawk/AP=nodal/AE=ftam_resp
```

Figure 3-4 Dir_rdn Structure



The numbers are for example purposes only. The top Dir_rdn points to two Dir_ava; the lower Dir_rdn points to one Dir_ava.

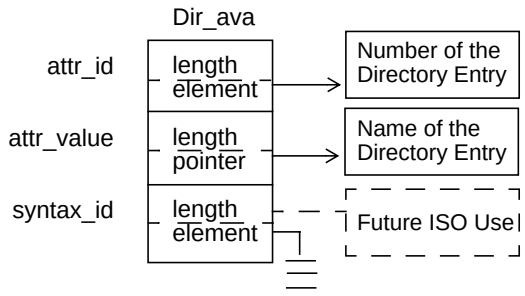
Dir_ava

```
typedef struct Dir_ava /* Attribute Value assertions */
{
struct    Object_id       attr_id;
struct    Octet_string    attr_value;
struct    Object_id       syntax_id;   /* for future use */
} Dir_ava;
```

Dir_ava is the final embedded structure in the Ae_dir_name structure that defines the directory distinguished name (Figure 3-5).

Each Dir_ava contains the following fields: attr_id (e.g., country), attr_value (e.g., USA), and syntax_id (reserved for future ISO extensions).

Figure 3-5 Dir_ava Structure



attr_id — The attr_id is an attribute type identifier that is of type struct Object_id. You must set attr_id in one of these two ways.

- Set the first three fields to 2, 5, and 4. Set the fourth field to the directory entry identification number. You must use these numbers since they define a standard attribute type for the protocol.

  2 = joint_iso_ccitt

  5 = attribute syntax

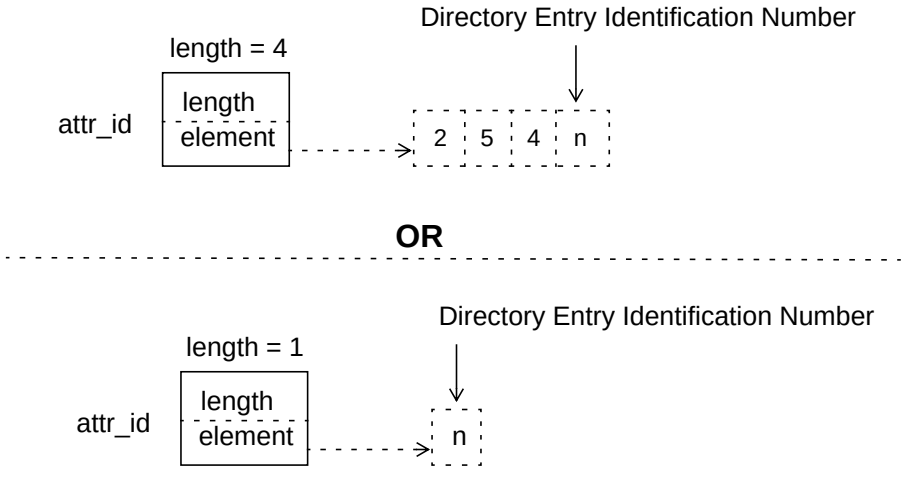
  4 = protocol Object_id

  n = attr_id or directory entry identification number

- Set only the directory entry identification number

attr_value — The attr_value is of type struct Octet_string. Set attr_value to the name of the country in the Directory Services entry. Set the length equivalent to the number of characters contained in the attr_value pointer.

Figure 3-6 attr_id Structure



Setting Ae_dir_name Example

This example sets the Ae_dir_name structure.

```
#include “map.h”
#include “mapftam.h”
#include %<stdio.h>
#include %<malloc.h>
/*
**
**                                setup_ddn
**
**  DESCRIPTION:
**    This routine assigns valid values to the Ae_dir_name
**    structure.
**
**
**  PARAMETERS:
**    Outputs:
**      dirname :      pointer to the Ae_dir_name structure
**                     Ae_dir_name is a pointer to struct
**                     Dir_dn.
**
*/
void
setup_ddn(dirname)
Ae_dir_name                            *dirname;
{
     /*
        Initialize all fields of the Ae_dir_name structure.
        Set up:
“/C=us/O=hp/OU=org_unit/CN=machine_name/CN=ftam_resp”
     */
  *dirname = (struct Dir_dn *)malloc(sizeof(struct Dir_dn));
  (*dirname)->rdn=(struct Dir_rdn *)malloc(5*sizeof(struct
Dir_rdn));
  (*dirname)->n = 5;
     /*
         C = us
         The Country attribute id is defined by ISO to be “6”.
     */
     (void)addrdn( & (*dirname)->rdn[0], 6, “us”);
     /*
         O = hp
         The Organization attribute id is defined by ISO to be
“10”.
     */
     (void)addrdn( & (*dirname)->rdn[1], 10, “hp”);
     /*
         OU = org_unit
        The Organization Unit attribute id is defined by ISO to be
“11”.
     */
     (void)addrdn( & (*dirname)->rdn[2], 11, “org_unit”);
     /*
         AP = machine_name
        The Application Process attribute id is defined by ISO to
```

```
be “3”.
     */
     (void)addrdn( & (*dirname)->rdn[3], 3, “machine_name”);

     /*
         AE = ftam_resp
         The Application Entity attribute id is defined by ISO to
be “3”.
     */
     (void)addrdn( & (*dirname)->rdn[4], 3, “ftam_resp”);
}
/*
***                              addrdn
**
**  DESCRIPTION:
**    This routine sets up the Dir_rdn structure using the input
**    parameters for values.
**
**
**  PARAMETERS:
**    Input:
**      att_id :         integer value for the attribute id
**      att_value :      character string for the attribute value
**
**    Output:
**      rdn :            pointer to struct Dir_rdn being set up
**
*/
Sint32
addrdn(rdn, att_id, att_value)
struct Dir_rdn               *rdn;
int                          att_id;
char                         *att_value;
{
  /*   Allocate the memory for struct Dir_ava
  */
  rdn->n = 1;
  rdn->avas = (struct Dir_ava *)malloc(sizeof(struct Dir_ava));
  rdn->avas->attr_value.pointer = (Octet *)malloc
            (strlen(att_value)*sizeof(Octet));
  rdn->avas->attr_id.element = (Sint32 *)malloc(sizeof(Sint32));
  /*
          Set up the attribute id
  */
  *(rdn->avas->attr_id.element) = att_id;
  rdn->avas->attr_id.length = 1;
  /*
          Set up the attribute value
  */
  memcpy(rdn->avas->attr_value.pointer, att_value,
strlen(att_value));
  rdn->avas->attr_value.length = strlen(att_value);
  /*
          The syntax id is for future use
  */
  rdn->avas->syntax_id.element = NULL;
  rdn->avas->syntax_id.length = 0;
}
```

Ae_label

```
typedef Uint32        Ae_label
```

Ae_label Is Input To These Functions	Ae_label Is Output From These Functions
ft_aedeactivation()	ft_aeactivation()
ft_aereset()	ft_fcattributes()
ft_connect()	ft_fcopy()
ft_fcattributes()	ft_fdelete()
ft_fcopy()	ft_fmove()
ft_fdelete()	ft_frattributes()
ft_fmove()	
ft_frattributes()	

Ae_label identifies the ftam_init activated on a successful ft_aeactivation() request. On subsequent ft_connect(), ft_aereset(), and ft_aedeactivation() requests, you must specify the ae_label of the ftam_init servicing the user program.

Use Ae_label on HLCF functions to uniquely identify the desired ftam_init servicing the HLCF call.

- If the value pointed to by the ae_label is NULL, the interface activates ftam_init for you, returns its ae_label identifier to the user program, and then deactivates ftam_init.
- If the value is not NULL, the interfaces services the call based on the ftam_init identified by ae_label.

Ae_title

```
typedef union Ae_title
{
struct Object_id      ae_object_id;
struct Dir_dn            ae_dir_dn;
}  Ae_title;
```

Ae_title Is Input To These Functions	Ae_title Is Output From These Functions
ft_aeactivation()	ft_connect()
ft_connect()	

The my_ae_title input to ft_aeactivation() specifies the ae_title of the ftam_init to activate. The called_ae_title input to ft_connect() enables you to specify an optional ae_title for the responder.

Both my_ae_title and called_ae_title may be represented as either an ae_object_id or ae_dir_dn. However, HP-UX FTAM supports only ae_object_id.

The Ae_title_option value determines whether the Ae_title union takes the ae_object_id, ae_dir_dn, or No_value_option form.

Ae_title carries no semantic value. If not used, set length to zero and ae_dir_dn to NULL.

If you use Ae_title, the object_id.element value is set for you to the following value: 1 3 9999 1 ftam_nil_ap_title (7).

ae_object_id	Contains local and remote application entity (AE) information.
ae_dir_dn	Contains the directory distinguished name form of the Ae_title.

Ae_title_option

```
enum  Ae_title_option
{
    No_value_option,
    Dir_object_id_option,   /* Object_id value obtained from the
                             *  network or local system directory */
    User_object_id_option, /* Object_id value supplied by the
                            * user */
    Dir_dist_name_option, /* Use the distinguished name value
                           * provided by the my_dir_name
                           * or called_dir_name parameter. */
    User_dist_name_option /* Distinguished name value supplied
                           * by the user. */
};
```

Ae_title_option Is Input To These Functions	Ae_title_option Is Output From These Functions
ft_aeactivation()	None
ft_connect()	

Ae_title_option specifies whether to use the Object_id or directory distinguished name on ft_connect() and ft_aeactivation().

The following tables list the supported values for the appropriate functions. HP-UX responders return an error if you use an unsupported value.

Ae_title_option	ft_aeactivation()	ft_connect()
No_value_option	Supported	Supported
Dir_object_id_option	Supported	Not supported

Ae_title_option	ft_aeactivation()	ft_connect()
User_object_id_option	Supported	Supported
Dir_dist_name_option	Not supported	Not supported
User_dist_name_option	Not supported	Not supported

No_value_option	Ignore the Ae_title on ft_aeactivation() and ft_connect(); no Ae_title is sent to the remote system. • For ft_aeactivation(), use my_dir_name. • For ft_connect(), use the P_address if it exists; otherwise, use called_dir_name.
Dir_object_id_option	The network or local system directory supplies the Object_id. For ft_aeactivation(), FTAM uses my_dir_name to query the Initial Configuration Store (ICS) for the Object_id.
User_object_id_option	You supply the Object_id value. If you specify User_object_id_option, you must also specify ae_object_id in the Ae_title.
Dir_dist_name_option	Ignore the Ae_title. • For ft_aeactivation(), use my_dir_name as the Ae_title. • For ft_connect(), use called_dir_name as the Ae_title.
User_dist_name_option	You supply the directory distinguished name. If you specify User_dist_name_option, you must also specify ae_dir_dn in Ae_title union.

Api_rc

```
typedef struct Api_rc
{
Return_code   return_code; /* MAP errors */
Return_code   vendor_code; /* Optional Vendor defined errors */
} Api_rc;
```

Api_rc (Application Interface return_code) provides you with error information when a function fails. Every function has a parameter of this type, usually in its inout_dcb and usually defined as the result parameter.

return_code — Specifies the MAP 3.0 error that occurred. These errors are listed as defined FTExxx constants. Refer to the *HP FTAM/9000 Reference Manual* for a list of possible errors, their causes, and corrective actions.

- A return_code value of SUCCESS (zero) indicates the request went through the application interface, ftam_init, and responder, and returned back to the user program. If the return_code value indicates an error (non-zero), the error could be detected in any one of these locations.
- For synchronous calls, the function return value and return_code are always identical.
- For asynchronous calls with a function return value of SUCCESS, the return_code indicates the success or failure of the call.
- For asynchronous calls, the function return value and return_code are identical if the function return value of the original call is not SUCCESS.

vendor_code — Contains HP-UX vendor-specific error information that describes the error. Note, not all errors return vendor_codes.

The upper 16 bits contain the log instance.

The lower 16 bits define errors that are listed as defined FTVxxx constants. Refer to the *HP FTAM/9000 Reference Manual* for a list of possible vendor_codes, their causes, and corrective actions.

Connection_id

```
typedef Uint32        Connection_id;
```

Connection_id Is Input To These Functions	Connection_id Is Output From These Functions
ft_abort() ft_bgroup() ft_cancel() ft_cattributes() ft_close() ft_create() ft_delete() ft_deselect() ft_edata() ft_egroup() ft_erase() ft_etransfer() ft_fclose() ft_fopen() ft_ireceive() ft_locate() ft_nwcleared() ft_open() ft_rattributes() ft_rcancel() ft_rdata() ft_read() ft_rrequest() ft_sdata() ft_select() ft_write()	ft_connect()

If ft_connect() is successful, a unique identifier for the connection returns in connection_id. Thereafter, use connection_id for any of the functions listed in the above table to identify the connection to the desired filestore.

Each connection_id is unique to an application process.

Ft_access_context

```
enum    Ft_access_context {
                FT_AC_ENUM_DEFAULT                      = -1,
                FT_HIERARCHICAL_ALL_DATA_UNITS          = 0,
                FT_HIERARCHICAL_NO_DATA_UNITS           = 1,
                FT_FLAT_ALL_DATA_UNITS                  = 2,
                FT_FLAT_ONE_LEVEL_DATA_UNITS            = 3,
                FT_FLAT_SINGLE_DATA_UNIT                = 4,
                FT_UNSTRUCTURED_ALL_DATA_UNITS          = 5,
                FT_UNSTRUCTURED_SINGLE_DATA_UNIT        = 6
};
```

Ft_access_context Is Input To These Functions	Ft_access_context Is Output From These Functions
ft_read()	None

Ft_access_context specifies how you want to read the file depending on the document type.

- For FTAM-1, FTAM-3, and INTAP-1 files, you must specify FT_UNSTRUCTURED_ALL_DATA_UNITS.
- For FTAM-2 files, you must specify either FT_FLAT_ALL_DATA_UNITS or FT_UNSTRUCTURED_ALL_DATA_UNITS.

FT_FLAT_ALL_DATA_UNITS	For FTAM-2 files, specifies that you will see both file structure and data.
FT_UNSTRUCTURED_ALL_DATA_UNITS	For FTAM-2 files, specifies that you will see only data. For FTAM-1 and FTAM-3 files, reads the whole file.
FT_AC_ENUM_DEFAULT FT_HIERARCHICAL_ALL_DATA_UNITS FT_HIERARCHICAL_NO_DATA_UNITS FT_FLAT_ONE_LEVEL_DATA_UNITS FT_FLAT_SINGLE_DATA_UNIT FT_UNSTRUCTURED_SINGLE_DATA_UNIT	HP-UX responders return an error if you use one of these values.

Ft_access_control

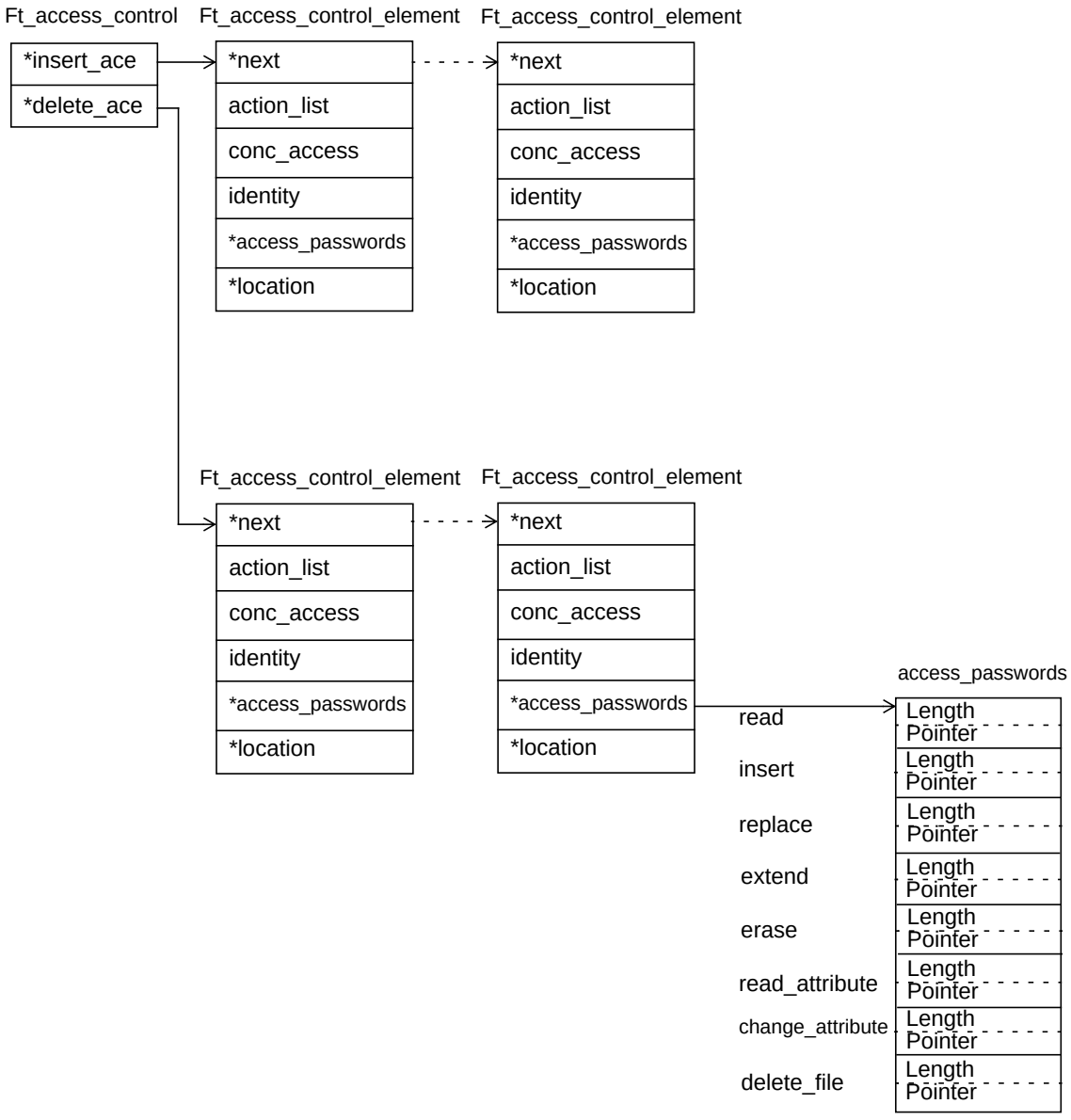
```
struct Ft_access_control {
       struct Ft_access_control_element   *insert_ace;
       struct Ft_access_control_element   *delete_ace;
};
```

Ft_access_control Is Input To These Functions	Ft_access_control Is Output From These Functions
ft_cattributes()	None
ft_create()	
ft_fcattributes()	
ft_fopen()	

Use Ft_access_control to add users to and delete users from the access list (Ft_access_control_elements) for a particular file. Both insert_ace and delete_ace are linked lists of Ft_access_control_element structures ( ). This structure specifies user access privileges for the file.

- If insert_ace is NULL when creating a file (ft_create() and ft_fopen()), anyone can access the file.
- If you use both insert_ace and delete_ace, HP-UX responders process delete_ace first.

Figure 3-7 Ft_access_control Structure



Ft_access_control_element

```
struct Ft_access_control_element {
      struct Ft_access_control_element  *next;
      Ft_file_actions                    action_list;
      Uint32                             conc_access;
      Ft_initiator_identity              identity;
      struct Ft_file_passwords           *access_passwords;
      Ae                                 *location;
};
```

Ft_access_control_element defines not only who can access a file, but also how they can access it. HP-UX initiators and responders use only the identity and action_list fields. You can set values in the other fields if another FTAM implementation uses them.

When interacting with an HP-UX FTAM responder, you can use at most three (3) access control elements, one each for user, group, and other. Other responders may have different requirements.

*next — Points to the next Ft_access_control_element structure in the linked list. For HP-UX FTAM responders, the maximum number in the linked list is three per file.

action_list — Specifies the allowable actions the designated users can perform on a file. An action is present if the corresponding bit is set (ON).

- Change Attribute
- Delete File
- Erase
- Extend
- Insert
- Read
- Read Attribute
- Replace

For ft_select() and ft_fopen(), the requested_access parameter must be a subset of the values stored in action_list.

For ft_open(), the processing_mode parameter must be a subset of the values stored in action_list.

The action_list is of type Ft_file_actions. Refer to the "Ft_file_actions" section for detailed information.

conc_access

The HP-UX implementation of FTAM ignores this value. You can set the bits in conc_access, but HP-UX initiators and responders will not use it. Other FTAM implementations might. If you are unsure of your situation, see the documentation for the other FTAM implementation.

Bits in conc_access correspond to the allowable actions listed in the action_list. Here are the allowed locks, in order, from least to most restrictive:

File Action Lock Set by conc_access	File Owner Can Perform the Action	Others Can Perform the Action
Not Required	No	Yes
Shared	Yes	Yes
Exclusive	Yes	No
No Access	No	No

Use the following defined constants to set any combination of conc_access bits for file actions. Again, note that these locks are ignored by HP-UX initiators and responders.

```
FT_AC_READ_NOTREQ    FT_AC_REPLACE_NOACC       FT_AC_READ_ATTRIB_EXCL
FT_AC_READ_SHARED    FT_AC_EXTEND_NOTREQ       FT_AC_READ_ATTRIB_NOACC
FT_AC_READ_EXCL      FT_AC_EXTEND_SHARED       FT_AC_CHANGE_ATTRIB_NOTREQ
FT_AC_READ_NOACC     FT_AC_EXTEND_EXCL         FT_AC_CHANGE_ATTRIB_SHARED
FT_AC_INSERT_NOTREQ  FT_AC_EXTEND_NOACC        FT_AC_CHANGE_ATTRIB_EXCL
FT_AC_INSERT_SHARED  FT_AC_ERASE_NOTREQ        FT_AC_CHANGE_ATTRIB_NOACC
FT_AC_INSERT_EXCL    FT_AC_ERASE_SHARED        FT_AC_DELETE_FILE_NOTREQ
FT_AC_INSERT_NOACC   FT_AC_ERASE_EXCL          FT_AC_DELETE_FILE_SHARED
FT_AC_REPLACE_NOTREQ FT_AC_ERASE_NOACC         FT_AC_DELETE_FILE_EXCL
FT_AC_REPLACE_SHARED FT_AC_READ_ATTRIB_NOTREQ  FT_AC_DELETE_FILE_NOACC
FT_AC_REPLACE_EXCL     FT_AC_READ_ATTRIB_SHARED
```

identity

Specifies the user to whom the access privileges pertain (the "owner" in the previous table). For HP-UX initiators and responders, identity must have one of the following values: user, group, or other.

The identity is of type struct Ft_initiator_identity. Refer to the "Ft_initiator_identity" section for detailed information.

*access_passwords	Specifies a user password for each element listed in the action_list. HP-UX initiators and responders do not use this information; access_passwords is only used with other FTAM implementations. Points to the Ft_file_passwords structure. Refer to the "Ft_file_passwords" section for detailed information.
*location	A pointer of type Ae. HP-UX initiators and responders do not use this information; location is only used with other FTAM implementations.

Ft_account

```
typedef char        *Ft_account;
```

Ft_account Is Input To These Functions	Ft_account Is Output From These Functions
ft_connect()	None
ft_create()	
ft_fcattributes()	
ft_fcopy()	
ft_fdelete()	
ft_fmove()	
ft_fopen()	
ft_frattributes()	
ft_select()	

HP-UX responders accept, but ignore, Ft_account. Setting the value to NULL is a recommended practice.

Ft_attribute_groups

```
typedef Uint16    Ft_attribute_groups;
```

Ft_attribute_groups Is Input To These Functions	Ft_attribute_groups Is Output From These Functions
ft_connect()	ft_connect()

Ft_attribute_groups specifies the level of support for attributes.

Attributes are grouped as either kernel, storage, security, or private.

- The kernel attributes are always present (i.e., you do not negotiate them).
- Attributes within the storage, security, and private groups are valid only if you negotiate that group during ft_connect().
- Response to an attribute value request (e.g., ft_cattributes()) always includes one of the following items:
  - If you request an unnegotiated attribute, the response includes no value available and an error (result_code); may optionally include a diagnostic.
  - If the HP-UX responder partially supports the attribute, the value (zero (0) for integers; “no value available” for strings) indicates that there is no value available.
  - If the HP-UX responder fully supports the attribute, actual values are returned.
- For ft_rattributes() and ft_frattributes(), the attribute_names field defaults to indicate all attributes in the attribute_ groups negotiated on the ft_connect() request.

The available attribute groups and their associated attributes are as follows:

Kernel Group	Provides basic attributes that are always available. filename permitted_actions contents_type
Storage Group	Provides additional information on how the file is stored. storage_account * [1] date_time_of_creation date_time_of_modification date_time_of_read date_time_of_attribute_mod[1] identity_of_creator identity_of_modifier[1] identity_of_reader[1] identity_of_attribute_mod[1] file_availability * filesize future_filesize *[1]

[1] When these values are output from HP-UX FTAM responders, the value (zero (0) for integers; “no value available” for strings) signifies there is no value for the attribute.

Security Group	Allows FTAM to enforce what users may operate on the file and what access each user has. access_control legal_qualification *
Private Group	ISO does not define the private attributes group. private_use *

* HP-UX responders accept, but ignore, these values.

To set attribute groups, use the FT_AG_xxx defined constants in the mapftam.h file.

FT_AG_STORAGE
FT_AG_SECURITY
FT_AG_PRIVATE

Ft_attribute_names

```
typedef Uint32 Ft_attribute_names;
```

Ft_attribute_names Is Input To These Functions	Ft_attribute_names Is Output From These Functions
ft_cattributes()	None
ft_create()	
ft_fcattributes()	
ft_fopen()	
ft_frattributes()	
ft_rattributes()	

This section discusses Ft_attribute_names as a primary structure. For information on Ft_attribute_names as it relates to the mask field in struct Ft_attributes, refer to the “Ft_attributes” section.

Ft_attribute_names specifies the attributes you want available for each file. Ft_attribute_names is the type for the mask field in Ft_attributes.

- In ft_create() and ft_fopen(), use Ft_attribute_names to specify which attributes you want to set for the newly created file.
- In ft_rattributes() and ft_frattributes(), use Ft_attribute_names to specify which attributes you want to read.
- In ft_cattributes() and ft_fcattributes(), use Ft_attribute_names to specify which attributes you want to change.

NOTE When using Ft_cattributes or Ft_fcattributes, the attribute_names field has precedence over attributes.mask.

Use Ft_attribute_names to set the attribute values you want available for each file. Use the FT_AN_xxx defined constants in the mapftam.h file.

```
FT_AN_FILENAME
FT_AN_PERMITTED_ACTIONS
FT_AN_CONTENT_TYPE
FT_AN_STORAGE_ACCT
FT_AN_CREATE_DATE_TIME
FT_AN_MOD_DATE_TIME
FT_AN_READ_DATE_TIME
FT_AN_ATT_MOD_DATE_TIME
FT_AN_ID_OF_CREATOR
FT_AN_ID_OF_MODIFIER
FT_AN_ID_OF_READER
FT_AN_ID_OF_ATT_MOD
FT_AN_FILE_AVAILABILITY
FT_AN_FILESIZE
FT_AN_FUTURE_FILESIZE
FT_AN_ACCESS_CONTROL
FT_AN_LEGAL_QUAL
FT_AN_PRIVATE_USE
```

If you invoke ft_rattributes() or ft_frattributes(), HP-UX responders return the indication no value available (0) for all partially supported attributes.

If you invoke functions that contain attributes in their input_dcb, HP-UX responders accept, but ignore, all partially supported attributes.

Ft_attributes

```
struct  Ft_attributes {
        Ft_attribute_names          mask;
        struct Ft_attribute_values  values;
};
```

Ft_attributes Is Input To These Functions	Ft_attributes Is Output From These Functions
ft_cattributes()	ft_cattributes()
ft_create()	ft_create()
ft_fcattributes()	ft_fcattributes()
ft_fopen()	ft_fcopy()
ft_select()	ft_fmove()
	ft_fopen()
	ft_frattributes()
	ft_rattributes()
	ft_select()

Every file contains attributes that uniquely identify the file and are inherent in its existence (e.g., filename). Ft_attributes is the primary structure for setting these attributes. You can change only certain file attributes after creating the file, so be careful to set these attributes as you want them during ft_fopen() and ft_create().

Attributes You Can Change	Attributes You Cannot Change
filename	permitted_actions
storage_account*	contents_type
file_availability*	date_time_of_creation
future_filesize*	date_time_of_modification
access_control	date_time_of_read
legal_qualification*	date_time_of_attribute_mod
private_use*	identity_of_creator
	identity_of_modifier
	identity_of_reader
	identity_of_attribute_mod
	filesize

* With HP-UX FTAM responders, changing these values has no effect.

Ft_attributes may exist in the input_dcb and inout_dcb.

mask	The mask identifies which attributes are available for each file.
values	The values identifies the attribute values of the attributes specified in the mask.

Ft_attribute_names

```
typedef Uint32 Ft_attribute_names;
```

Ft_attribute_names Is Input To These Functions	Ft_attribute_names Is Output From These Functions
ft_cattributes()	ft_cattributes()
ft_create()	ft_create()
ft_fcattributes()	ft_fcattributes()
ft_fopen()	ft_fopen()
ft_frattributes()	ft_frattributes()
ft_rattributes()	ft_rattributes()

Ft_attribute_names is the type for the mask field in Ft_attributes.

Use Ft_attribute_names to identify which attributes you want available for each file. Use only those values in the FT_AN_XXX defined constants. Refer to the previous “Ft_attribute_names” section for more information.

NOTE When using Ft_cattributes or Ft_fcattributes, the attribute_names field has precedence over attributes.mask.

Ft_attribute_values

```
struct  Ft_attribute_values {
        Ft_filename                     filename;
        Ft_permitted_actions            permitted_actions;
        struct  Ft_contents_type        contents_type;
        Ft_account                      storage_account;
        Time                            date_time_of_creation;
        Time                            date_time_of_modification;
        Time                            date_time_of_read;
        Time                            date_time_of_attribute_mod;
        Ft_initiator_identity           identity_of_creator;
        Ft_initiator_identity           identity_of_modifier;
        Ft_initiator_identity           identity_of_reader;
        Ft_initiator_identity           identity_of_attribute_mod;
        enum    Ft_file_availability    file_availability;
        Sint32                          filesize;
        Sint32                          future_filesize;
        struct  Ft_access_control       access_control;
        Ft_legal_qualification          legal_qualification;
        struct  Octet_string            private_use;
};
```

Use Ft_attribute_values to specify the attribute values you want each attribute to have.

filename — Character string that identifies the name of the file.

permitted_actions — Specifies all allowable actions on the file (without specifying who is allowed to perform the actions). The permitted_actions is type Ft_permitted_actions.

- For each file, set bits in permitted_actions for the actions you are allowing to be performed. Use these defined constants:

  FT_PA_READ
  FT_PA_INSERT
  FT_PA_REPLACE
  FT_PA_EXTEND
  FT_PA_ERASE
  FT_PA_READ_ATTRIBUTE
  FT_PA_CHANGE_ATTRIBUTE
  FT_PA_DELETE_FILE
  FT_PA_TRAVERSAL
  FT_PA_REV_TRAVERSAL
  FT_PA_RANDOM_ORDER

- Each document type defines certain permitted_actions values, as follows:

FTAM-1, -2, -3, INTAP-1 and NBS-9	**FTAM-1, FTAM-3 and INTAP-1**	**FTAM-2**
CHANGE_ATTRIBUTE	ERASE	ERASE
DELETE_FILE	EXTEND	INSERT
READ	REPLACE	TRAVERSAL
READ_ATTRIBUTE		

contents_type — Specifies the document type of the file; the contents_type is of type struct Ft_contents_type. Refer to the “Ft_contents_type” section for a detailed explanation.

storage_account	Identifies the accountable authority responsible for accumulated file storage charges. HP-UX FTAM responders set storage_account so that the indication no value available (0) returns if you invoke ft_rattributes() or ft_frattributes(). If you invoke functions that contain storage_account in the input_dcb, HP-UX responders accept, but ignore, the value.
	Specifies, respectively, the following dates.
date_time_of_creation	Date file was created
date_time_of_modification	Date file was last modified
date_time_of_read	Date file was last read
date_time_of_attribute_mod*	Date file attributes were last modified
	These values are of type Time.
	Specifies, respectively, the following user identities:
identity_of_creator	User who created the file
identity_of_modifier*	User who last modified the file
identity_of_reader*	user who last read the file
identity_of_attribute_mod*	User who last modified the file attributes

* Returns no value available

file_availability — The file_availability is of the following type:

```
enum    Ft_file_availability {
                                    FT_IMMEDIATE_AVAIL,
                                    FT_DEFERRED_AVAIL
};
```

For HP-UX responders, you can access the file immediately regardless of which value you select. For some implementations, file_availability indicates whether a delay occurs before you can access the file.

filesize — Specifies the maximum size (in Octets) of the file.

future_filesize — Specifies the maximum size (in Octets) to which the file may grow if you modify or extend it. HP-UX responders return a value of zero (no value) on calls to ft_rattributes() or ft_frattributes().

access_control — Defines the conditions under which you and other users can access the file. The access_control is of type struct Ft_access_control and specifies who can access the file, their access privileges, types of file locks, and user passwords. Refer to the “Ft_access_control” section for a detailed explanation.

legal_qualifications — Conveys information about the legal status of the file and its use. HP-UX responders return a value of zero (no value) on calls to ft_rattributes() or ft_frattributes().

private_use — HP-UX responders return a value of zero (no value) on calls to ft_rattributes() or ft_frattributes().

Ft_concurrency_control

```
struct  Ft_concurrency_control {
        enum    Ft_file_lock       read;
        enum    Ft_file_lock       insert;
        enum    Ft_file_lock       replace;
        enum    Ft_file_lock       extend;
        enum    Ft_file_lock       erase;
        enum    Ft_file_lock       read_attribute;
        enum    Ft_file_lock       change_attribute;
        enum    Ft_file_lock       delete_file;
};
```

Ft_concurrency_control Is Input To These Functions	Ft_concurrency_control Is Output From These Functions
ft_create()	ft_fopen()
ft_fcopy()	ft_open()
ft_fcattributes()	
ft_fdelete()	
ft_fmove()	
ft_fopen()	
ft_frattributes()	
ft_open()	
ft_select()	

Concurrency locks define whether users can simultaneously access a file. Ft_concurrency_control specifies the type of available concurrency locks for each action on a file.

Change Attribute	Insert
Delete File	Read
Erase	Read Attribute
Extend	Replace

Each value is of type enum Ft_file_lock which specifies the type of concurrency locks on a file.

Setting allowable file actions and locks requires that you follow a few rules. Familiarize yourself with struct Ft_concurrency_control and enum Ft_file_lock, and then review the rules in the “Rules for Ft_concurrency_control” section.

Ft_file_lock

```
enum    Ft_file_lock {
                    FT_NOT_REQUIRED     = 0,
                    FT_SHARED           = 1,
                    FT_EXCLUSIVE        = 2,
                    FT_NO_ACCESS        = 3
};
```

Ft_file_lock enumerates the type of locks on a file. It is the enumerated type for values in struct Ft_concurrency_control. For example, if you want to be able to read a file, but you do not want other users to be able to, set the concurrency_control.read lock to FT_EXCLUSIVE.

File Action Lock Set by Ft_file_lock	Owner May Perform The Action	Others May Perform The Action
Not Required	No	Yes
Shared	Yes	Yes
Exclusive	Yes	No
No Access	No	No

Rules for Ft_concurrency_control

- You may wish to set concurrency control to NULL wherever it exists as a parameter. This way, the responder uses its own default values. HP-UX responders use the defaults specified in the NBS Phase III agreements. The values used by a responder during the open regime are returned in the inout_dcb of the ft_open() and ft_fopen() calls.
- If you use concurrency control (concurrency control is not NULL), you must specify a lock for each file action.
- For those actions that are available (because you requested them in the requested_access parameter), the applicable locks are FT_SHARED and FT_EXCLUSIVE.
- For those actions not available (because you did not request them in the requested_access parameter), the applicable locks are FT_NO_ACCESS and FT_NOT_REQUIRED.

- The ft_open() concurrency control must be identical to—or more restrictive than—the ft_select() concurrency control; it may not be less restrictive

CAUTION

When a system has an NFS-mounted file system , two different files can have the same device id and inode number. If both are used by FTAM concurrently, the locks applied to one file could interfere with a select or open operation on the other file.

Furthermore, files on NFS-mounted file systems are visible on more than one host. Therefore, it is possible for FTAM to have locks on the same file from two different hosts. While each host may believe it has exclusive access to the file, in fact both hosts have concurrent access.

Table 3-1 Concurrency Control: Default Settings

In the SELECT regime:	For actions not set in the requested_access parameter, corresponding locks default to:	For each action set in the requested_access parameter, if the action is read or read_attribute, the corresponding lock defaults to:	For each action set in the requested_access parameter, otherwise, the corresponding lock defaults to:
	Not Required	Shared	Exclusive

In the OPEN regime:	By default, all locks in the OPEN regime are set to the lock value for the current SELECT regime, either the defaults (above) or user-selected.

Ft_contents_type_element

```
struct  Ft_contents_type_element     {
        struct  Ft_contents_type_element        *next_element;
        struct  Ft_contents_type                contents_type;
};
```

Ft_contents_type_element Is Input To These Functions	Ft_contents_type_element Is Output From These Functions
ft_connect()	ft_connect()

On input, Ft_contents_type_element is the requested document types per connection; on output, it is a linked list of allowable (negotiated) document types per connection. Use Ft_contents_type_element to specify up to three document types: FTAM-1, FTAM-2, and FTAM-3.

*next_element	Points to the next Ft_contents_type_element structure in the linked list. HP-UX responders accept up to three Ft_contents_type_element structures; after three, HP-UX responders ignore the value. HP-UX responders accept only FTAM-1, FTAM-2, and FTAM-3 document types; if you request any other document type, HP-UX responders remove the element from the response list.
contents_type	Per connection, specify one contents_type for each document type you want to manipulate (transfer, access, or manage).

Ft_contents_type

```
struct  Ft_contents_type {
      enum    Ft_contents_form      contents_form;
      union   Ft_contents_info      contents_info;
};
```

Ft_contents_type specifies the allowable document type for a particular file.

Ft_contents_type is the type for the contents_type field in struct Ft_contents_type_element (a linked list of allowable document types per connection). This structure is also nested within the values field, which is of type struct Ft_attributes.

contents_form	Specifies the contents_type form as a known or unknown document type.
contents_info	Specifies the exact document type.

Ft_contents_form

```
enum        Ft_contents_form {
            FT_DOCUMENT_TYPE          = 0,
            FT_ABS_CON_SET_PAIR_FORM  = 1,
            FT_CONTENTS_UNKNOWN       = 2
};
```

Ft_contents_form specifies whether contents_type is a known or unknown document type.

- For all functions that use the Ft_contents_type, (except ft_fopen() and ft_open()), you must specify FT_DOCUMENT_TYPE.
- HP-UX FTAM does not permit you to use the value FT_ABS_CON_SET_PAIR_FORM.
- Specify FT_CONTENTS_UNKNOWN on ft_open() and ft_fopen() if you do not know the document type; the document type is returned in the inout_dcb.

Ft_contents_info

```
union   Ft_contents_info {
        struct Ft_document_type      document;
        struct Ft_abs_con_set_pair   abs_con_set_pair;
};
```

Ft_contents_info specifies the document type.

- If you specified FT_DOCUMENT_TYPE in Ft_contents_form, specify the document.
- If you specified FT_CONTENTS_UNKNOWN in Ft_contents_form, Ft_contents_info is ignored.
- As noted under Ft_contents_form, HP-UX responders do not permit use of the abs_con_set_pair structure.

Ft_document_type

```
struct  Ft_document_type {
        struct  Object_id     name;
        char                  *parameters;
};
```

Ft_document_type defines the document type structure of the file. For detailed information (e.g., restrictions imposed) on document types, refer to the “Document Types and Constraint Sets” chapter.

name Specifies the name of the document type and is of the following type struct Object_id (from map.h).

```
struct Object_id
{
    Uint16      length;
    Sint32      *element;  /* List of integers */
};
```

- Set the length field to 5 for all document types except NBS-9; for document type NBS-9 set length to 6.

  ```
  struct Ft_contents_type    cont_type;
  cont_type.contents_info.document.name.length = 5;
  ```

- Specify the document_type name by setting the element array as follows:

  1 0 8571 5 1 for FTAM-1 document type
  1 0 8571 5 2 for FTAM-2 document type
  1 0 8571 5 3 for FTAM-3 document type
  1 2 392 10 2 1 for INTAP-1 document type
  1 3 14 5 5 9 for NBS-9 document type

EXAMPLE: This example sets the Ft_contents_type structure for an FTAM-3 file.

The document_type name for FTAM-3 is 1 0 8571 5 3

```
struct Ft_contents_type             cont_type;

struct Ft_dt_ftam_3                *ftm_3;


cont_type.contents_form = FT_DOCUMENT_TYPE;
ftm_3 = (struct Ft_dt_ftam_3 *)malloc(sizeof(struct Ft_dt_ftam_3));
cont_type.contents_info.document.name.element =
(Sint32 *)malloc(5*sizeof(Sint32));


ftm_3->string_length = 512;
ftm_3->significance = FT_SS_NO_SIGNIFICANCE;
cont_type.contents_info.document.parameters = (char *)ftm_3;


cont_type.contents_info.document.name.length = 5;
cont_type.contents_info.document.name.element[0]=1;
cont_type.contents_info.document.name.element[1]=0;
cont_type.contents_info.document.name.element[2]=8571;
cont_type.contents_info.document.name.element[3]=5;
cont_type.contents_info.document.name.element[4]=3;
```

*parameters Generic pointer to one of the following structures: Ft_dt_ftam_1, Ft_dt_ftam_2, Ft_dt_ftam_3, Ft_dt_intap_1, or Ft_dt_nbs_9.

Ft_dt_ftam_1.

```
struct Ft_dt_ftam_1
{
    enum  Ft_class                class;
    Uint16                        string_length;
    enum Ft_string_significance   significance;
};
```

- The class must be FT_CL_IA5_STRING or FT_CL_GENERAL_STRING.
- The string_length supported by responders must be at least 0 to 134; for HP-UX responders, string_length is unlimited.
- The significance must be FT_SS_NO_SIGNIFICANCE.

Ft_dt_ftam_2.

```
struct Ft_dt_ftam_2
{
    enum  Ft_class                class;
    Uint16                        string_length;
    enum Ft_string_significance   significance;
};
```

- The class must be FT_CL_GRAPHIC_STRING.
- The string_length supported by responders must be at least 0 to 134; for HP-UX responders, string_length is unlimited.
- The significance must be FT_SS_NO_SIGNIFICANCE.

Ft_dt_ftam_3.

```
struct Ft_dt_ftam_3
{
    Uint16                        string_length;
    enum Ft_string_significance   significance;
};
```

- Ft_dt_ftam_3 defaults to FT_CL_OCTET_STRING.
- The string_length supported by responders must be at least 0 to 512; for HP-UX responders, string_length is unlimited.
- The significance must be FT_SS_NO_SIGNIFICANCE.

Ft_dt_intap_1.

```
struct Ft_dt_intap_1
{
    Uint16                          record_length;
    enum Ft_string_significance     significance;
};
```

- Ft_dt_intap_1 defaults to FT_CL_OCTET_STRING.
- The record_length is unlimited.
- The significance must be FT_SS_VARIABLE or FT_SS_FIXED.

Ft_dt_nbs_9.

```
struct Ft_dt_nbs_9
{
     Ft_attribute_names          mask;
};
```

- mask is a 32-bit unsigned integer. Use any of the FT_AN_xxx defined constants to set bits in the mask. See Ft_attribute_names for details.
- This parameter is used only on a call to ft_open(). An NBS-9 document (a directory) can only be opened for reading. Therefore, any attribute names you supply on the ft_open() call specify the attributes you will receive for the files in the directory.
- If you omit this parameter, the responder will supply default attributes. HP-UX FTAM responders will return all attributes by default.

Ft_data_unit

```
struct  Ft_data_unit {
     struct  Ft_data_unit          *next;
     enum Ft_structure_id          structure_id;
     union {
         struct Ft_data_element    *data_element;
         struct Ft_node_descriptor *node;
     } data;
};
```

Ft_data_unit Is Input To These Functions	Ft_data_unit Is Output From These Functions
ft_sdata()	ft_rdata()

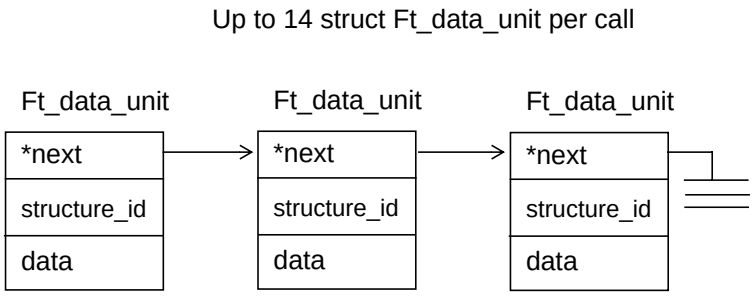
Ft_data_unit is a linked list of data units (maximum 14 data units per call). Each data unit contains the data that FTAM manipulates (Figure 3-8).

The responder uses Ft_data_unit to return data when you call ft_rdata().

For variable and fixed data, data element boundaries are preserved. You receive the exact sequence of data elements that existed in the original file.

If Ft_string_significance is FT_SS_NO_SIGNIFICANCE, data element boundaries are ignored. Up until the final data element, the responder returns the maximum string_length allowed per data element. The final data element contains the remaining data.

Figure 3-8 **Ft_data_unitcStructure**



NOTE To understand Ft_data_unit, you should be familiar with the concepts FADU, data unit, data element, and node descriptor. Refer to the "HP-UX FTAM Overview" chapter for descriptions.

*next	Points to the next Ft_data_unit structures in the linked list. The maximum is 14.
structure_id	Specifies which structure in the data union is applicable.
data	The data union contains *data_element and *node. The value you choose in Ft_structure_id dictates which structure you choose in the data union. • The *data_element is of type struct Ft_data_element and contains the actual data. • The *node is of type struct Ft_node_descriptor and indicates a new FADU.

Ft_structure_id

```
enum     Ft_structure_id  {
                        FT_DATA_UNIT        = 0,
                        FT_NODE_DESC        = 1,
                        FT_ENTER_SUBTREE    = 2,
                        FT_EXIT_SUBTREE     = 3,
                        FT_DATA_END_IND     = 4,
                        FT_CANCEL_IND       = 5
};
```

Ft_structure_id specifies which structure in the data union is applicable (Ft_data_element or Ft_node_descriptor) or it specifies the end or cancellation of data transfer (on output only).

FT_DATA_UNIT	Use FT_DATA_UNIT to send actual data. FT_DATA_UNIT dictates that you choose data_element in the data union.
FT_NODE_DESC	Use FT_NODE_DESC only for FTAM-2 document types to begin a new FADU. FT_NODE_DESC dictates that you choose node in the data union.
FT_ENTER SUBTREE FT_EXIT_SUBTREE	HP-UX responders return an error if you use either of these values.
FT_DATA_END_IND	When using ft_rdata(), FTAM returns FT_DATA_END_IND in inout_dcb.data_unit->structure_id to indicate data transmission is complete.
FT_CANCEL_IND	If an error occurs when transferring data, FTAM returns FT_CANCEL_IND in inout_dcb.data_unit->structure_id to indicate data transmission is cancelled. To acknowledge the data transfer was cancelled, you must issue ft_rcancel() to exit the Data Transfer regime.

Ft_data_element

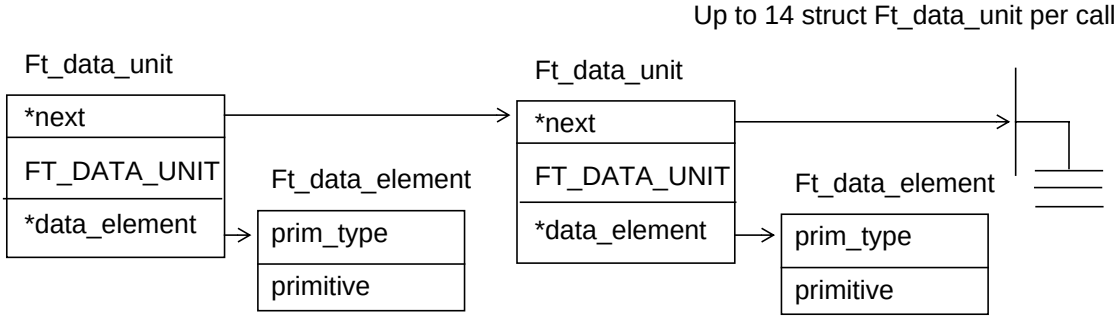
```
struct  Ft_data_element {
        enum Ft_prim_type {
                        FT_DE_BOOLEAN             = 1,
                        FT_DE_INTEGER             = 2,
                        FT_DE_BIT_STRING          = 3,
                        FT_DE_OCTET_STRING        = 4,
                        FT_DE_NULL                = 5,
                        FT_DE_IA5_STRING          = 22,
                        FT_DE_UTC                 = 23,
                        FT_DE_TIME                = 24,
                        FT_DE_GRAPHIC_STRING      = 25,
                        FT_DE_VISIBLE_STRING      = 26,
                        FT_DE_GENERAL_STRING      = 27,
                        FT_DE_FLOATING_POINT      = 100,
                        FT_DE_UL_FLOAT            = 101,
                        FT_DE_UL_INTEGER          = 102,
                        FT_DE_ATTRIBUTES          = 200
                        FT_DE_RECORD_END          = 201
                        FT_DE_RECORD_CONT         = 202
        } prim_type;
```

```
        union Ft_primitive {
           Bool                          boolean;
           Sint32                        integer;
           struct Bit_string             bit_string;
           struct Octet_string           octet_string;
           struct Octet_string           ia5string;
           Time                          utc;
           Time                          time;
           char                          *graphic_string;
           char                          *visible_string;
           struct Octet_string           general_string;
           double                        floating_point;
           struct Octet_string           ul_integer;
           struct Ft_ul_floating_point {
               Sint16                    sign;
               struct Bit_string         mantissa;
               struct Octet_string       exponent;
           } ul_floating_point;
           struct Ft_attributes          attributes;
           struct Octet_string           record_end;
           struct Octet_string           record_cont;
        } primitive;
};
```

Set Ft_data_element if you specified FT_DATA_UNIT in Ft_structure_id.

Ft_data_element contains an enum Ft_prim_type that indicates which primitive is relevant in union Ft_primitive (Figure 3-9).

Figure 3-9 Ft_data_element Structure



prim_type The prim_type specifies which field in the primitive union to select. Only a subset is valid for each document type:

FTAM-1	FTAM-2	FTAM-3 and INTAP-1	NBS-9
IA5_STRING GENERAL_STRING GRAPHIC_STRING GENERAL_STRING	GRAPHIC_STRING GENERAL_STRING	OCTET_STRING	ATTRIBUTE

primitive The primitive is the specific unit that contains actual data. Set primitive to the value specified by prim_type. See the previous table. Note that the maximum string length is 7168 (7K) octets.

EXAMPLE: This example sets a data_element for FTAM-2 document type.

```
struct Ft_data_unit                 data_unit;


data_unit.next = NULL;
data_unit.structure_id = FT_DATA_UNIT;
data_unit.data.data_element = (struct Ft_data_element *)
malloc(sizeof (struct Ft_data_element));


data_unit.data.data_element->prim_type = FT_DE_GRAPHIC_STRING;
data_unit.data.data_element->primitive.graphic_string =
“This example shows data in a data element;”
```

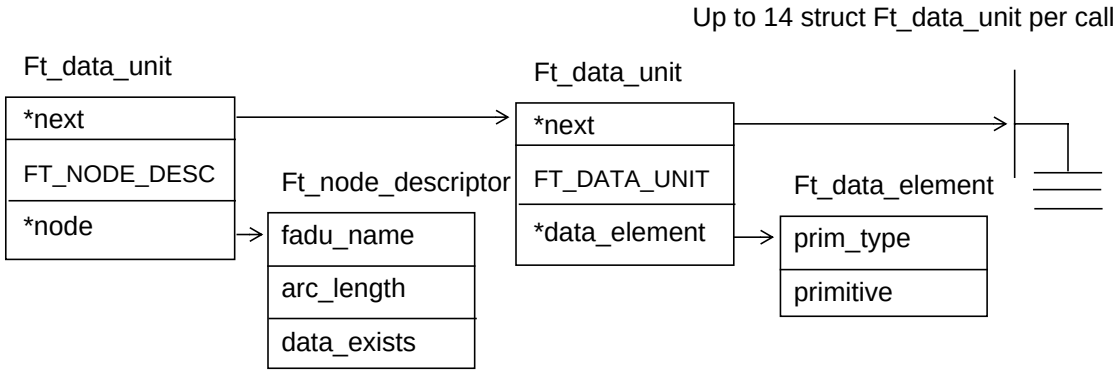
Ft_node_descriptor

```
struct  Ft_node_descriptor {
        Ft_fadu_name        fadu_name;
        Uint16              arc_length;
        Bool                data_exists;
};
```

Set Ft_node_descriptor if you specified FT_NODE_DESC in Ft_structure_id (Figure 3-10).

Use Ft_node_descriptor only with FTAM-2 document types to begin a new FADU.

Figure 3-10 Ft_node_descriptor Structure



fadu_name — HP-UX responders accept, but ignore, the fadu_name field. HP recommends you set the fadu_name.length to zero and fadu_name.pointer to NULL.

arc_length — You must set arc_length to 1 since FTAM-2 is confined by the sequential flat constraint set (which has only one hierarchical level).

data_exists — You must set data_exists to TRUE since all FADUs must contain data.

EXAMPLE: This example sets the node_descriptor for an FTAM-2 document type.

```
struct Ft_data_unit                  data_unit;
data_unit.next = NULL;
data_unit.structure_id = FT_NODE_DESC;
data_unit.data_node = (struct Ft_node_descriptor *)
     malloc(sizeof (struct Ft_node_descriptor));
data_unit.data.node->fadu_name.length = 0;
data_unit.data.node->fadu_name.pointer = NULL;
data_unit.data.node->arc_length = 1;
data_unit.data.node->data_exists = TRUE;
```

NOTE Creating the Ft_data_unit linked lists for FTAM-2 document types requires that you follow a few rules. First, familiarize yourself with the Ft_node_descriptor structure. Then read the next section, which describes the necessary rules.

Rules for Ft_data_unit Linked Lists (FTAM-2 Only)

The following rules apply to Ft_data_unit linked lists for FTAM-2 document types only.

- If you have an empty file, you must begin the linked list with a node descriptor (not a data element).
- If a file already contains data, you may or may not have a node descriptor, depending on whether you are starting a new FADU.
- Do not immediately follow a node descriptor with another node descriptor.

  You may, however, follow a data element with another data element (i.e., node descriptors may have multiple data elements).
- You may submit an ft_sdata() request containing only a node descriptor, though you must follow it with an ft_sdata() request that starts with a data element.
- Do not use more than one node descriptor per ft_sdata() request.
- You must set node.arc_length to 1.
- You must set data_exists to TRUE since FADUs must contain data.

Ft_dcb_type

```
enum    Ft_dcb_type {
                    FTiAeactivation          = 0,
                    FToAeactivation          = 1,
                    FTiAedeactivation        = 2,
                    FToAedeactivation        = 3,
                    FTiConnect               = 4,
                    FToConnect               = 5,
                    FTiRelease               = 6,
                    FToRelease               = 7,
                    FTiAbort                 = 8,
                    FToAbort                 = 9,
                    FTiAereset               = 10,
                    FToAereset               = 11,
                    FTiIreceive              = 12,
                    FToIreceive              = 13,
                    FToNwcleared             = 99,
                    FTiFCopy                 = 100,
                    FToFCopy                 = 101,
                    FTiFMove                 = 102,
                    FToFMove                 = 103,
                    FTiFDelete               = 104,
                    FToFDelete               = 105,
                    FTiFRattributes          = 106,
                    FToFRattributes          = 107,
                    FTiFCattributes          = 108,
                    FToFCattributes          = 109,
                    FTiFOpen                 = 110,
                    FToFOpen                 = 111,
                    FTiFClose                = 112,
                    FToFClose                = 113,
                    FTiSelect                = 200,
                    FToSelect                = 201,
                    FTiDeselect              = 202,
                    FToDeselect              = 203,
                    FTiOpen                  = 204,
                    FToOpen                  = 205,
                    FTiClose                 = 206,
                    FToClose                 = 207,
                    FTiCreate                = 208,
                    FToCreate                = 209,
                    FTiDelete                = 210,
                    FToDelete                = 211,
                    FTiReadattributes        = 212,
                    FToReadattributes        = 213,
                    FTiChangeattributes      = 214,
                    FToChangeattributes      = 215,
                    FTiRead                  = 216,
                    FToRead                  = 217,
                    FTiWrite                 = 218,
```

The Ft_dcb_type data type is continued on the next page.

This Ft_dcb_type data type is continued from the previous page.

```
                    FToWrite                = 219,
                    FTiErase                = 220,
                    FToErase                = 221,
                    FTiLocate               = 222,
                    FToLocate               = 223,
                    FTiSData                = 224,
                    FToSData                = 225,
                    FTiRData                = 226,
                    FToRData                = 227,
                    FTiDataEnd              = 228,
                    FToDataEnd              = 229,
                    FTiTransEnd             = 230,
                    FToTransEnd             = 231,
                    FTiBGroup               = 232,
                    FToBGroup               = 233,
                    FTiEGroup               = 234,
                    FToEGroup               = 235,
                    FTiCancel               = 236,
                    FToCancel               = 237,
                    FTiRCancel              = 238,
                    FToRCancel              = 239
};
```

Ft_dcb_type Is Input To These Functions	Ft_dcb_type Is Output From These Functions
ft_didcb()	None

Ft_dcb_type identifies the type of data control block (DCB). The ft_didcb() function then initializes and allocates memory for the fixed parameters within the specified DCB.

- A lowercase i after FT indicates an input_dcb.
- A lowercase o after FT indicates an inout_dcb.

Ft_delete_action

```
enum    Ft_delete_action {
                            FT_DELETE_FILE       = 0,
                            FT_DONT_DELETE_FILE  = 1
};
```

Ft_delete_action Is Input To These Functions	Ft_delete_action Is Output From These Functions
ft_fclose()	None

Ft_delete_action specifies whether to delete a file or only deselect it on an ft_fclose() function.

FT_DELETE_FILE	Closes, deselects, and then deletes the file.
FT_DONT_DELETE_FILE	Closes and deselects, but does not delete the file.

Ft_delete_overwrite

```
enum    Ft_delete_overwrite {
                            FT_RECREATE_FILE       = 0,
                            FT_DONT_RECREATE_FILE  = 1
};
```

Ft_delete_overwrite Is Input To These Functions	Ft_delete_overwrite Is Output From These Functions
ft_fcopy()	None
ft_fmove()	

Ft_delete_overwrite specifies whether or not to copy over (ft_fcopy()) or move over (ft_fmove()) an existing file.

FT_RECREATE_FILE	Copy or move the source file over the existing destination file.
FT_DONT_RECREATE_FILE	Do not copy or move the source file over the existing destination file; the function fails and you receive an error.

Ft_diagnostic

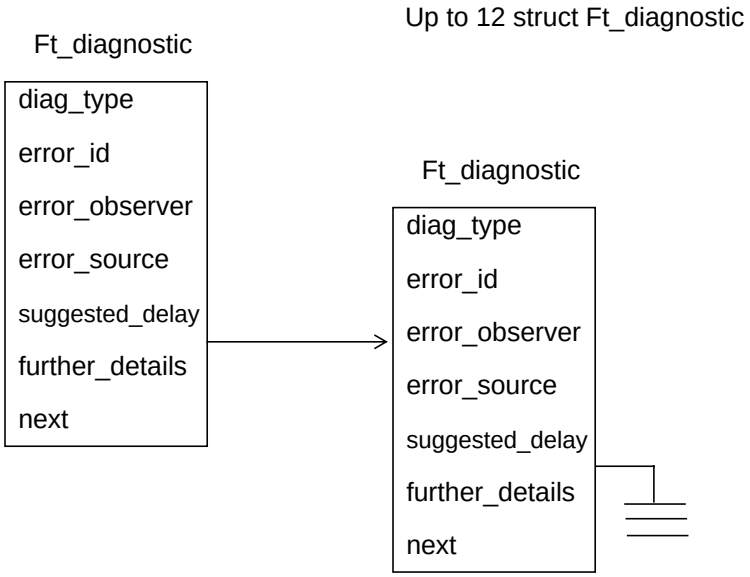
```
struct  Ft_diagnostic {
                struct Ft_diagnostic      *next;
                enum   Ft_diag_type       diag_type;
                Uint16                    error_id;
                enum   Ft_entity_ref      error_observer;
                enum   Ft_entity_ref      error_source;
                Uint16                    suggested_delay;
                char                      *further_details;
};
```

Ft_diagnostic Is Input To These Functions	Ft_diagnostic Is Output From These Functions
ft_abort()	ft_cattributes()
ft_cancel()	ft_close()
ft_edata()	ft_connect()
ft_rcancel()	ft_create()
	ft_delete()
	ft_deselect()
	ft_edata()
	ft_erase()
	ft_etransfer()
	ft_fcattributes()
	ft_fclose()
	ft_fcopy()
	ft_fdelete()
	ft_fmove()
	ft_fopen()
	ft_frattributes()
	ft_ireceive()
	ft_locate()
	ft_open()
	ft_rattributes()
	ft_sdata()
	ft_select()
	ft_rdata()

Ft_diagnostic provides additional information for ISO-specific errors.

The further_details field may vary across different vendor responders. Refer to the *HP FTAM/9000 Reference Manual* for a list of HP-UX diagnostic messages, their probable causes, and possible corrective actions.

Figure 3-11 Ft_diagnostic Structure



*next	Linked list of Ft_diagnostic structures; maximum number is 12.
diag_type	Specifies the kind of ISO error that occurred.
error_id	Specifies the integer representing the ISO error that occurred; defined in f_error.h.
error_observer	Specifies the entity that detected the error.

error_source	Specifies the entity in which the error occurred.
suggested_delay	Specifies the amount of time to wait before attempting recovery if the Ft_diag_type is FT_TRANSIENT. HP-UX responders do not use this field; they never return a diag_type of FT_TRANSIENT.
*further_details	Provides additional information (a text message) about the cause of the error. This information may vary among different vendor responders.

Ft_diag_type

```
enum    Ft_diag_type {
                FT_INFORMATIVE    = 0,
                FT_TRANSIENT      = 1,
                FT_PERMANENT      = 2
};
```

Ft_diag_type specifies the kind of ISO error that occurred and is the enumeration for the diag_type field, which is of type struct Ft_diagnostic.

FT_INFORMATIVE	The error does not affect the current file service and therefore, does not require recovery. An example is F_CREATE_SLCTD_EXIST_FILE, which means override selected an existing file.
FT_TRANSIENT	The current file service is affected. It requires recovery.
FT_PERMANENT	The FTAM request failed.

Ft_entity_ref

```
enum    Ft_entity_ref {
                FT_NOT_CATEGORIZED                          = 0,
                FT_INITIATING_FILE_SERVICE_USER             = 1,
                FT_INITIATING_FILE_PROTOCOL_MACHINE         = 2,
                FT_SERVICE_SUPPORTING_FILE_PROTOCOL_MACHINE = 3,
                FT_RESPONDING_FILE_PROTOCOL_MACHINE         = 4,
                FT_RESPONDING_FILE_SERVICE_USER             = 5
};
```

Ft_entity_ref identifies the entity that detected the error (error_observer) and where the error occurred (error_source). You may find this information particularly helpful if the error occurs with other vendors.

FT_NOT_CATEGORIZED	The error may have occurred or been detected anywhere.
FT_INITIATING_FILE_SERVICE_USER	The error is in the user program.
FT_INITIATING_FILE_PROTOCOL_-MACHINE	The error is in or detected by the initiator.
FT_SERVICE_-SUPPORTING_FILE_-PROTOCOL_MACHINE	The error is in one of the lower layers, probably the Presentation Service.
FT_RESPONDING_FILE_PROTOCOL_-MACHINE	The error is in or detected by the responder.
FT_RESPONDING_FILE_SERVICE_-USER	The error is in or detected by the VFS.

Ft_fadu_identity

```
struct  Ft_fadu_identity {
      enum   Ft_fadu_form         fadu_form;
      union Ft_fadu_info         fadu_info;
};
```

Ft_fadu_identity Is Input To These Functions	Ft_fadu_identity Is Output From These Functions
ft_erase()	ft_locate()
ft_locate()	
ft_read()	
ft_write()	

Ft_fadu_identity identifies the whole file (the single FADU) for FTAM-1, FTAM-3, and INTAP-1 files. This structure also identifies either the whole file or individual FADUs for FTAM-2 files. Use the identified FADUs to erase, read, and write (FTAM-1, FTAM-2, and FTAM-3) and to locate (FTAM-2 only).

fadu_form	The fadu_form indicates you will use either a FADU location or number. *For HP-UX responders, you must use location*.
fadu_info	The fadu_info specifies the FADU location or number.

Ft_fadu_form

```
enum    Ft_fadu_form {
           FT_FADU_LOCATION        = 0,
           FT_FADU_NAME            = 1,
           FT_FADU_NAME_LIST       = 2,
           FT_FADU_NUMBER          = 3
};
```

Ft_fadu_form is the type for the fadu_form field in Ft_fadu_identity.

- The value specified in fadu_form dictates the value used in fadu_info.
- For HP-UX responders, you must specify FT_FADU_LOCATION. HP-UX responders return an error if you use FT_FADU_NAME, FT_NAME_LIST, or FT_NUMBER.

Ft_fadu_info

```
union Ft_fadu_info  {
        enum       Ft_fadu_location   fadu_location;
        Ft_fadu_name                  fadu_name;
        struct    Ft_fadu_name_list   fadu_name_list;
        Sint32                        fadu_number;
};
```

Ft_fadu_info is the type for fadu_info in struct Ft_fadu_identity and is also the union for the enum Ft_fadu_form.

Ft_fadu_info specifies the actual fadu_identity location.

fadu_location — Specifies the FADU location you want to access within a file. If you selected FT_FADU_LOCATION in Ft_fadu_form, you must specify fadu_location.

- The fadu_location is of the type Ft_fadu_location.

```
enum       Ft_fadu_location {
                FT_FIRST        = 0,
                FT_LAST         = 1,
                FT_PREVIOUS     = 2,
                FT_CURRENT      = 3,
                FT_NEXT         = 4,
                FT_BEGIN        = 5,
                FT_END          = 6
};
```

FT_FIRST	First FADU in the file.
FT_LAST *	Last FADU in the file.
FT_PREVIOUS*	The FADU immediately before the FADU where the file pointer is currently located.
FT_CURRENT *	The FADU where the file pointer is currently located.

FT_NEXT	The FADU immediately after the FADU where the file pointer is currently located.
FT_BEGIN	For ft_read(), ft_write(), and ft_erase(), initial location in the file, before all FADUs. For ft_locate(), earliest FADU in the file.
FT_END	The final location in the file, after all FADUs.

*Invalid for use with HP-UX responders.

- Use only FT_FIRST for FTAM-1, FTAM-3, INTAP-1, and NBS-9 document types (constrained by the Unstructured All constraint set).
- Use any of the fields for FTAM-2 document type (constrained by the Sequential Flat constraint set).
- You can locate, read, write, and erase the whole file or leaf FADUs as defined in the following table. Remember, only FTAM-2 files have leaf FADUs.
- For example, you can locate any of the individual FADUs, but you can only erase the whole file.

	ft_locate()	**ft_read()**	**ft_write()**	**ft_erase()**
Begin	Leaf FADU	Whole File		Whole File
End	End of File		End of File	
First	Leaf FADU	Leaf FADU		
Last	Leaf FADU	Leaf FADU		
Current	Leaf FADU	Leaf FADU		
Next	Leaf FADU	Leaf FADU		
Previous	Leaf FADU	Leaf FADU		

fadu_name fadu_name_list fadu_number	HP-UX responders return an error if you use these fields.

Ft_fadu_operation

```
enum    Ft_fadu_operation {
                        FT_INSERT    = 0,
                        FT_REPLACE   = 1,
                        FT_EXTEND    = 2
};
```

Ft_fadu_operation Is Input To These Functions	Ft_fadu_operation Is Output From These Functions
ft_write()	None

Ft_fadu_operation specifies the action you are taking on a FADU.

FT_INSERT	Inserts data at the end of a file (*FTAM-2 only*).
FT_REPLACE	Replaces the existing FADU contents (*FTAM-1, FTAM-3, and INTAP-1 only*).
FT_EXTEND	Appends data to the end of the existing FADU (*FTAM-1, FTAM-3, and INTAP-1 only*).

Ft_file_actions

```
typedef Uint16 Ft_file_actions;
```

Ft_file_actions Is Input To These Functions	Ft_file_actions Is Output From These Functions
ft_create()	None
ft_fopen()	
ft_select()	

If you have access control, Ft_file_actions specifies the allowable actions the designated users can perform on a file. If you do not have access control, Ft_file_actions specifies the requested actions on the file.

Ft_file_actions is the type for the action_list field in struct Ft_access_control_elements (defines who can access a file and how they can access it). Ft_file_actions is also the type of the requested_access parameter in the File Selection regime.

- Use the FT_FA_XXX defined constants in the mapftam.h header file.

  FT_FA_READ

  FT_FA_INSERT

  FT_FA_REPLACE

  FT_FA_EXTEND

  FT_FA_ERASE

  FT_FA_READ_ATTRIBUTE

  FT_FA_CHANGE_ATTRIBUTE

  FT_FA_DELETE_FILE

FT_FA_READ	Reads contents of the file (FTAM-1, FTAM-3, and INTAP-1) or of the FADU (FTAM-2).
FT_FA_INSERT	Inserts data at the end of a file (FTAM-2 only).
FT_FA_REPLACE	Replaces the existing FADU contents (FTAM-1, FTAM-3, and INTAP-1 only).
FT_FA_EXTEND	Appends data to the end of the existing FADU (FTAM-1, FTAM-3, and INTAP-1 only).
FT_FA_ERASE	Erases the entire file.
FT_FA_READ_ATTRIBUTE	Reads the file attributes.
FT_FA_CHANGE_ATTRIBUTE	Changes the file attributes.D
FT_FA_DELETE_FILE	Deletes the entire file.

Ft_file_passwords

```
struct  Ft_file_passwords {
        Ft_single_file_pw  read;
        Ft_single_file_pw  insert;
        Ft_single_file_pw  replace;
        Ft_single_file_pw  extend;
        Ft_single_file_pw  erase;
        Ft_single_file_pw  read_attribute;
        Ft_single_file_pw  change_attribute;
        Ft_single_file_pw  delete_file;
};
```

Ft_file_passwords Is Input To These Functions	Ft_file_passwords Is Output From These Functions
ft_create()	None
ft_fcopy()	
ft_fmove()	
ft_fcattributes()	
ft_fopen()	
ft_frattributes()	
ft_select()	

NOTE Since the HP-UX file system does not define file passwords, HP-UX FTAM responders do not use file password information.

Ft_file_passwords specifies a user password for each action. To use file passwords, first negotiate security in Ft_attribute_groups during the connection establishment. You must use file_passwords for each action you request if the following conditions are true:

- The file has an access_control_element with an identity field that specifies you.
- The action listed in actions_list has an associated password.

Ft_file_status

```
enum    Ft_file_status {
                        FT_FS_ENUM_DEFAULT          = -1,
                        FT_NEW                      = 0,
                        FT_OLD                      = 1,
                        FT_REPLACE_CONTENTS         = 2,
                        FT_RECREATE                 = 3,
                        FT_UNKNOWN                  = 4
};
```

Ft_file_status Is Input To These Functions	Ft_file_status Is Output From These Functions
ft_create()	None
ft_fopen()	

Ft_file_status determines what action to take in the file specified on ft_create() or ft_fopen() already exists. Ft_file_status specifies whether to create or select a file and the effects these actions have on the already existing file.

If the file does not exist, a new file is created.

Ft_file_status Field	If The File Already Exists
FT_FS_ENUM_DEFAULT	For ft_create(), request fails For ft_fopen(), existing file selected
FT_NEW	Request fails
FT_OLD	Existing file selected

FT_REPLACE_CONTENTS	Existing file contents deleted Existing file attributes remain the same Existing file selected
FT_RECREATE	Existing file contents and attributes deleted New file created with attributes specified in struct Ft_attributes
FT_UNKNOWN	Existing file selected

Ft_filename

```
typedef char        *Ft_filename;
```

Ft_filename s Input To These Functions	Ft_filename Is Output From These Functions
ft_create()	None
ft_fcattributes()	
ft_fcopy()	
ft_fdelete()	
ft_fmove()	
ft_fopen()	
ft_frattributes()	

Ft_filename identifies a specific file with a unique path name given in the syntax of the original file in the real filestore.

Ft_functional_units

```
typedef Uint16    Ft_functional_units;
```

Ft_functional_units Input To These Functions	Ft_functional_units Is Output From These Functions
ft_connect()	ft_connect()

Ft_functional_units specifies which functions are available per connection. You must use the FT_FU_XXX defined constants to specify Ft_functional_units.

```
FT_FU_READ
FT_FU_WRITE
FT_FU_FILE_ACCESS
FT_FU_LTD_MGMT(Limited File Management)
FT_FU_ENH_MGMT(Enhanced File Management)
FT_FU_GROUPING
FT_FU_FADU_LOCKING
FT_FU_RECOVERY
FT_FU_RESTART_XFR
```

- HP-UX responders accept, but ignore, FT_FU_FADU_LOCKING, FT_FU_RECOVERY, and FT_FU_RESTART_XFR.
- By default, you always have the following functions.

ft_aeactivation()	ft_deselect()
ft_deactivation()	ft_select()
ft_ireceive()	ft_aereset()
ft_didcb()	ft_abort()
ft_dfdcb()	ft_release()
ft_gperror()	ft_connect()

- You must negotiate Ft_functional_units on the ft_connect() request. For example, if you want to be able to read a file, set FT_FU_READ when making the ft_connect() request.
- Ft_service_class dictates the mandatory and optional functional_units (as noted in the following table). Ft_service_class must support all selected Ft_functional_unit values; otherwise, you receive an error. Refer to the "Ft_service_class" section for detailed information.

EXAMPLE: On ft_connect(), if you specify the FT_SC_TRANSFER service_class,

  - You must specify FT_FU_GROUPING functional_units,
  - You must specify either or both FT_FU_READ and FT_FU_WRITE,
  - You may optionally specify either or both FT_FU_LTD_MGMT and FT_FU_ENH_MGMT, and
  - You cannot specify FT_FU_FILE_ACCESS.
- The kernel functional_unit is always available.

The following table shows the service_classes you should set to use the functional_units. Use this key to read the table.

TSC=File Transfer Service Class

ASC=File Access Service Class

MSC=File Management Service Class

TMSC=File Transfer and Management Service Class

USC=Unconstrained Service Class

M = Mandatory

O = Optional

• = One or Both

X = Not Permitted

See the previous page for the reference key to this table.

Functional Unit	FTAM Functions	TSC	ASC	MSC	TMSC	USC
Kernel	ft_abort ft_aeactivation ft_aedeactivation ft_aereset ft_connect ft_deselect ft_ireceive ft_rrequest ft_select	M	M	M	M	M
Read	ft_cancel ft_close ft_etransfer ft_open ft_rcancel ft_rdata ft_rdataqos ft_read	•	M	X	•	O
Write	ft_cancel ft_close ft_edata ft_etransfer ft_nwcleared ft_rcancel ft_sdata ft_open ft_sdata ft_write	•	M	X	•	O
File Access	ft_erase ft_locate	X	M	X	X	O
Limited File Management	ft_create ft_delete ft_rattributes	O	O	M	M	O
Enhanced File Management	ft_cattributes	O	O	O	O	O
Grouping	ft_bgroup ft_egroup	M	O	M	M	O

Ft_initiator_identity

```
typedef char       *Ft_initiator_identity;
```

Ft_initiator_identity Is Input To These Functions	Ft_initiator_identity Is Output From These Functions
ft_connect()	None
ft_fdelete()	
ft_fcattributes()	
ft_fcopy()	
ft_fmove()	
ft_frattributes()	

Ft_initiator_identity identifies the HP-UX login account if using HP-UX responders. This structure is the type for the following fields and specifies the following user identities.

identity_of_creator	User who created the file
identity_of_modifier*	User who last modified the file
identity_of_reader*	User who last read the file
identity_of_attribute_mod*	User who last modified file attributes
initiator_identity*	User's login account
	In Ft_access_control_element, user who has the access privileges

* HP-UX responders accept, but ignore, these values.

Ft_processing_mode

```
typedef Uint16 Ft_processing_mode;
```

Ft_processing_mode Input To These Functions	Ft_processing_mode Is Output From These Functions
ft_open()	None

Ft_processing_mode specifies the current file action for ft_open () (i.e., specifies an action you want to perform now).

- These actions must be a subset of those actions selected in requested_access (FT_FA_XXX defined constants).
- Only after closing the file can you specify other actions through Ft_processing_mode (if you first re-open the file).
- You must use one of the following FT_PM_XXX defined constants to specify Ft_processing_mode:

FT_PM_READ	Reads contents of the file (*FTAM-1, FTAM-3, INTAP-1, and NBS-9*) or of the FADU (*FTAM-2*).
FT_PM_INSERT	Inserts data at the end of a file (*FTAM-2 only*).
FT_PM_REPLACE	Replaces the existing FADU contents (*FTAM-1, FTAM-3, and INTAP-1 only*).
FT_PM_EXTEND	Appends data to the end of the existing FADU (*FTAM-1, FTAM-3, and INTAP-1 only*).
FT_PM_ERASE	Erases the entire file. (*FTAM-1, FTAM-2, FTAM-3, and INTAP-1 only*).

Ft_qos

```
enum    Ft_qos  {
                    FT_NO_RECOVERY       = 0,
                    FT_CLASS_1_RECOVERY  = 1,
                    FT_CLASS_2_RECOVERY  = 2,
                    FT_CLASS_3_RECOVERY  = 3
};
```

Ft_qos Is Input To These Functions	Ft_qos Is Output From These Functions
ft_connect()	ft_connect()

Ft_qos determines the level of recovery by FTAM by specifying which recovery classes are active. The qos stands for quality of service.

FT_NO_RECOVERY	FTAM does not automatically attempt recovery. You must select FT_NO_RECOVERY and perform the recovery.
FT_CLASS_1_RECOVERY	Transient errors occurring during data transfer are recovered by restarting the data transfer.
FT_CLASS_2_RECOVERY	Transient errors occurring during data transfer are recovered by restarting the select/open regime.
FT_CLASS_3_RECOVERY	Not supported. If this class is selected, you will receive the error FTE 173_INV_FTQOS.

Ft_service_class

```
typedef Uint16    Ft_service_class;
```

Ft_service_class Is Input To These Functions	Ft_service_class Is Output From These Functions
ft_connect()	ft_connect()

Ft_service_class specifies whether you transfer, access, or manage a file per connection. You must use one of the following FT_SC_XXX defined constants to specify Ft_service_class:

Service Class	Description
Unconstrained FT_SC_UNCONSTRAINED	Allows you to request any combination of functional_units with the mandatory kernel group
File Management FT_SC_MANAGEMENT	Allows you to manipulate whole files Change attributes Create files Delete files Read attributes

File Transfer FT_SC_TRANSFER	Allows you to transfer data
File Transfer and Management FT_SC_TRANSFER_AND_MGMT	Allows you to move or copy bulk data Allows you to manipulate whole files: Change attributes Create files Delete files Read attributes Combines all capabilities of File Transfer and File Management
File Access FT_SC_ACCESS	Allows you to transfer data Provides you with access to individual FADUs

You can use any of the following combinations of service_classes. Note, you cannot use FT_SC_UNCONSTRAINED by itself; you must use it in conjunction with other service_classes.

- FT_SC_MANAGEMENT
- FT_SC_TRANSFER
- FT_SC_ACCESS
- FT_SC_TRANSFER and FT_SC_ACCESS
- FT_SC_MANAGEMENT, FT_SC_TRANSFER, and FT_SC_TRANSFER_AND_MGMT
- FT_SC_MANAGEMENT, FT_SC_TRANSFER, FT_SC_ACCESS, and FT_SC_TRANSFER_AND_MGT
- FT_SC_UNCONSTRAINED and FT_SC_MANAGEMENT
- FT_SC_UNCONSTRAINED and FT_SC_TRANSFER
- FT_SC_UNCONSTRAINED and FT_SC_ACCESS

- FT_SC_UNCONSTRAINED, FT_SC_TRANSFER and FT_SC_ACCESS
- FT_SC_UNCONSTRAINED, FT_SC_MANAGEMENT, FT_SC_TRANSFER, and FT_SC_TRANSFER_AND_MGMT
- FT_SC_UNCONSTRAINED, FT_SC_MANAGEMENT, FT_SC_TRANSFER, FT_SC_ACCESS, and FT_SC_TRANSFER_AND_MGT
- You must negotiate Ft_service_class when calling ft_connect().
- Ft_service_class defines the mandatory and optional Ft_functional_units. Set these restrictions using the defined constants. Each FT_SC_XXX dictates which FT_FU_XXX (Ft_functional_unit) defined constants are mandatory and optional (as noted in the following table).

EXAMPLE: On ft_connect(), if you specify the FT_SC_TRANSFER_AND_MGT service_class,

- You must specify FT_FU_GROUPING and FT_FU_LTD_MGMT functional_units,
- You must specify either or both FT_FU_READ and FT_FU_WRITE,
- You can optionally specify FT_FU_ENH_MGMT, and
- You cannot specify FT_FU_FILE ACCESS.

Service Class	Mandatory Functional Units	One or Both Functional Units	Optional Functional Units	Not Allowed
Unconstrained	• Kernel		• Enhanced File Mgmt • File Access • Group • Limited File Mgmt • Read • Write	
Management	• Kernel • Grouping • Limited File Management		• Enhanced File Mgmt	• File Access • Read • Write
Transfer	• Kernel • Grouping	• Read • Write	• Enhanced File Mgmt • Limited File Mgmt	• File Access
Transfer and Management	• Kernel • Grouping • Limited File Mgmt	• Read • Write	• Enhanced File Mgmt	• File Access
Access	• Kernel • File Access • Read • Write		• Enhanced File Mgmt • Grouping • Limited File Mgmt	

Ft_service_class restricts the way in which you can group functions (with ft_egroup()). Refer to the following table and list to determine these restrictions.

- If using FT_SC_TRANSFER, open the file with group #1, transfer data as needed, and close the file with group #2.
- If using FT_SC_MANAGEMENT, you must use group #3 and you cannot call low level functions outside of this group.

- If using FT_SC_TRANSFER_AND_MGMT, you must use group #1 and #2, or use group #3, as follows.
  - Open the file with group #1, transfer data as needed, and close the file with group #2 OR
  - Use group #3 to select or create a file, read or change attributes, and deselect or delete the file.
- If you select FT_SC_ACCESS, you can use any of the groupings.

Mandatory Beginning Functions	Must Have One of these Functions	Optional Functions	Must Have One of these Functions	Mandatory Ending Functions
#1 ft_bgroup()	ft_select() ft_create()	ft_rattributes() ft_cattributes()	ft_open()	ft_egroup()
#2 ft_bgroup()	ft_close()	ft_rattributes() ft_cattributes()	ft_deselect() ft_delete()	ft_egroup()
#3 ft_bgroup()	ft_select() ft_create()	ft_rattributes() ft_cattributes()	ft_deselect() ft_delete()	ft_egroup()
#4 ft_bgroup()	ft_select() ft_create()	ft_rattributes() ft_cattributes()		ft_egroup()
#5 ft_bgroup()		ft_rattributes() ft_cattributes()	ft_deselect() ft_delete()	ft_egroup()

Ft_single_file_pw

```
typedef struct Octet_string     Ft_single_file_pw;
```

Ft_single_file_pw s Input To These Functions	Ft_single_file_pw Is Output From These Functions
ft_connect() ft_create() ft_fcattributes() ft_fcopy() ft_fdelete() ft_fmove() ft_frattributes()	None

Ft_single_file_pw is of type struct Octet_string which contains a length field (Uint16) and a pointer field (Octet_pointer). The meaning of Ft_single_file_pw varies as noted in the following table.

Function	Ft_single_file_pw	Description
ft_connect() ft_fcattributes() ft_fdelete() ft_frattributes()	file_store_pw	Password for initiator_identity.
ft_create() fcopy() ft_fmove()	create_file_pw	Password to establish permission to create files in the filestore; HP-UX responders accept, but ignore, this value.
ft_fcopy() ft_fmove()	source_filestore_p wdest_filestore_pw	Password for source_init_id. Password for dest_init_id.
ft_fdelete()	delete_file_pw	Password to establish permission to delete files in the filestore. HP-UX responders accept, but ignore, this value.

inout_dcb

You receive large amounts of data from the FTAM interface. To reduce the number of exposed parameters, Ft_output and Ft_xxx_out_dcb contain a group of parameters. The xxx varies, depending on the function (e.g., Ft_rdata_out_dcb). Except for size, all inout_dcb parameters are output parameters.

Ft_output

```
struct  Ft_output {
        Uint32                          size;
        struct Api_rc                   result;
};
```

Ft_output Is Input To These Functions	Ft_output Is Output From These Functions
Only the Ft_output size parameter and only if you use Ft_output in those calls listed in the output column	ft_abort() ft_aeactivation() ft_aedeactivation() ft_aereset()

You must either pass the address of an Ft_output or you must pass the address of a NULL value. If you pass the address of an Ft_output, you must have enough memory to return size and result.

size	The size of the Ft_output structure and associated data in Octets. The size parameter is mandatory input if using Ft_output.
result	The result is of type Api_rc and provides error information.

Ft_xxx_out_dcb

```
struct  Ft_xxx_out_dcb {
        Uint32                                  size;
        struct Api_rc                           result;
        Function-specific       info;
};
```

Ft_xxx_out_dcb Is Input To These Functions	Ft_xxx_out_dcb Is Output From These Functions
Only the Ft_xxx_out_dcb size parameter and only if you use Ft_xxx_out_dcb in those calls listed in the output column	ft_bgroup() ft_cancel() ft_cattributes() ft_close() ft_connect() ft_create() ft_delete() ft_deselect() ft_edata() ft_egroup() ft_erase() ft_etransfer() ft_fcattributes() ft_fclose() ft_fcopy() ft_fdelete() ft_frattributes() ft_fmove() ft_fopen() ft_ireceive() ft_locate() ft_nwcleared() ft_open() ft_rattributes() ft_rcancel() ft_rdata() ft_read() ft_rrequest() ft_sdata() ft_select() ft_write()

You must either pass the address of an inout_dcb or you must pass the address of a a NULL value. If you pass the address of an inout_dcb, you must have enough memory to return size and result. You may or may not supply additional values, depending on the function.

size	The size of the Ft_xxx_out_dcb structure and associated data in Octets. The size parameter is mandatory input if using Ft_xxx_out_dcb.
result	The result is of type Api_rc and provides error information.

Memory Allocation for inout_dcbs

For asynchronous calls, the memory occupied by Ft_output and Ft_xxx_out_dcb is logically inconsistent until the request completes. Therefore, you should not reference the inout_dcb from the time the asynchronous call returns SUCCESS until em_wait() verifies completion of the request.

You can allocate memory for Ft_output and Ft_xxx_out_dcb in three ways.

- The recommended method is to have the output inout_dcb parameter reference the address of a NULL value when making the call. By doing so, the FTAM interface allocates the memory necessary; thus, you avoid having to anticipate how much memory is required.

  After the FTAM function returns or for asynchronous calls, after em_wait() returns SUCCESS, you must call ft_dfdcb() to free the memory (even though the FTAM interface allocated the memory).
- Allocate the memory yourself (e.g., using malloc() or using variables). Ensure the size field is large enough to hold all possible return information; otherwise, you may receive an FTE004_OUTPUT_BUFFER_OVERFLOW error. For example, you want to have a size large enough to store the inout_dcb structure and all possible returning diagnostics (a linked list of 14).
- Before the request, invoke ft_didcb() to allocate memory for Ft_xxx_out_dcb. Free the memory used by the input_dcb parameter by invoking ft_dfdcb() after the function returns (synchronous calls) or after em_wait() returns (asynchronous calls). Ensure the

additional_size parameter is large enough to hold all possible return information (e.g., diagnostics and returned data); otherwise, you receive an FTE004_OUTPUT_BUFFER_OVERFLOW error.

NOTE

Your application must not perform any operations on or with an inout DCB parameter until em_-wait() indicates the call is complete. Failure to follow this rule can cause serious internal errors to occur, resulting in unpredictable behavior or software failures.

input_dcb

```
struct Ft_xxx_in_dcb
      {
        .
        .
        .
      };
```

Ft_xxx_in_dcb Is Input To These Functions	Ft_xxx_in_dcb Is Output From These Functions
ft_abort() ft_aeactivation() ft_bgroup() ft_cancel() ft_cattributes() ft_close() ft_connect() ft_create() ft_delete() ft_deselect() ft_edata() ft_egroup() ft_erase() ft_etransfer() ft_fcattributes() ft_fclose() ft_fcopy() ft_fdelete() ft_frattributes() ft_fmove() ft_fopen() ft_ireceive() ft_locate() ft_open() ft_rattributes() ft_rcancel() ft_read() ft_rrequest() ft_select() ft_write()	None

You pass large amounts of data to the FTAM interface. To reduce the number of exposed parameters, the Ft_xxx_in_dcb contains optional and function-specific parameters.

The input_dcb parameters may be mandatory or optional; they must occur after the exposed input parameters and before the inout_dcb parameters. If any of the input_dcb parameters are mandatory, you must pass the address of an input_dcb; otherwise, you may pass a NULL value.

You can allocate memory for Ft_xxx_in_dcb two ways. If you are using optional parameters, remember to allocate memory for them.

- Allocate the memory yourself (e.g., using malloc() and free(), or C variables).
- Before the request, a recommended practice is to invoke ft_didcb() to allocate memory for Ft_xxx_in_dcb and then set the appropriate Ft_xxx_in_dcb fields. After the request completes, invoke ft_dfdcb() to free the memory used by Ft_xxx_in_dcb.

Local_event_name

```
typedef Sint32        Local_event_name;
```

Local_event_name Is Input To These Functions	Local_event_name Is Output From These Functions
ft_abort() ft_aeactivation() ft_aedeactivation() ft_aereset() ft_bgroup() ft_cancel() ft_cattributes() ft_close() ft_connect() ft_create() ft_delete() ft_deselect() ft_edata() ft_egroup() ft_erase() ft_etransfer() ft_fcattributes() ft_fclose() ft_fcopy() ft_fdelete() ft_frattributes() ft_fmove() ft_fopen() ft_ireceive() ft_locate() ft_nwcleared() ft_open() ft_rattributes() ft_rcancel() ft_rdata() ft_read() ft_rrequest() ft_sdata() ft_select() ft_write()	em_wait()

Local_event_name uniquely identifies a specific asynchronous function call and also determines whether a call is synchronous or asynchronous.

If the call is synchronous, the value must be zero (0).

The em_wait() function uses Local_event_name to identify a completed asynchronous operation. This identification is the same value that you passed to the operation when you initiated it. Though em_wait() can wait on multiple asynchronous operations, only one Local_event_name returns per call. You must know the Local_event_name of the event for which you are waiting.

Each outstanding asynchronous function must have a unique Local_event_name with a value greater than zero (0). A recommended practice is to start with the value one (1) and then increase by increments. You will find this method especially helpful when tracking incoming events.

P_address

```
struct P_address
{
struct Octet_string *p_selector; /* NULL if it is not present */
struct Octet_string *s_selector; /* NULL if it is not present */
struct Octet_string *t_selector; /* NULL if it is not present */
Sint16 n_nsaps; /* Number of NSAPs */
struct Octet_string *nsaps; /* ptr to a sequence of NSAPs */} ;
/* Maximum length of psap_selector is 16 Octets.
 * Maximum length of ssap_selector is 16 Octets.
 * Maximum length of tsap_selector is 32 Octets.
 * Maximum length of NSAP is 20 Octets.
 * Maximum number of NSAPS is 8.
 */
```

P_address Is Input To These Functions	P_address Is Output From These Functions
ft_connect()	ft_connect()

As an alternative to specifying the directory distinguished name, you can specify the P_address when invoking ft_connect() to communicate with other systems and processes.

The P_address must be unique within the network and must be exactly the same as the one set during configuration. To have the system automatically set the P_address structure, call convert_paddr; the source is in /opt/ftam/demos/cnvrt_addr.c.

- Each application on a node must have a unique triple of p_selector, s_selector, and t_selector. For example, one application could have (0000,0000,0000), another (0000,0000,0001), and another (2375,232323,75757575).
- Each node must have a unique nsap.
- The maximum length of the P_address is 224 Octets. These Octets can be printable or unprintable characters.
- Each called_dir_name has a corresponding P_address. Directory Services provides the mapping between the two.

p_selector	Presentation Service Access Point Selector: unique value that allows network layers to identify the connection to its peer.
s_selector	Session Service Access Point Selector: unique value that allows network layers to identify the connection to its peer.
t_selector	Transport Service Access Point Selector: unique value that allows network layers to identify the connection to its peer.
n_nsaps	Number of nsaps (Network Service Access Points) The maximum number of nsaps is eight. You might want to have multiple nsaps to uniquely label cards if using two network cards on one machine.
nsaps	Network Service Access Point: unique value that allows network layers to identify the connection to its peer.

4 Using Support Functions

Use support functions for a variety of purposes, such as managing your memory. Refer to the “Example Programs” chapter for model programs using the support functions.

NOTE

References to Event Management functions mean the combination of em_fdmemory(), em_wait(), and em_gperror().

Support functions are not bound to a specific regime. The only exception is ft_nwcleared(), which is used only when ft_sdata() returns the error FTE008_NO_CON_RESOURCES.

Chapter Overview

This chapter describes the following functions in the order listed.

Task to Perform	Function Used to Perform the Task	Description
Managing Memory	ft_dfdcb()	De-allocate memory for DCBs (dynamic DCB de- allocation)
	ft_didcb()	Allocate memory for DCBs (dynamic DCB allocation)
	em_fdmemory()	Free dynamic memory allocated by em_gperror() for the return_code and vendor_code strings
	ft_fdmemory()	Free dynamic memory allocated by ft_gperror() for the return_code and vendor_code strings
Responding to Asynchronous Calls	em_wait()	Suspends application processing until a MAP event occurs
	em_hp_select()	Suspends application processing until a MAP or non- MAP event occurs
	em_hp_sigio()	Notifies that an asynchronous call completed by way of a SIGIO
Translating Error Messages	em_gperror()	Translate returned Event Management return_codes and vendor_codes to printable strings
	ft_gperror()	Translate returned FTAM return_codes and vendor_codes to printable strings
Determining Available Resources	ft_nwcleared()	Determine that a resource constraint cleared and that resource is now available

Managing Memory

Use ft_didcb() and ft_dfdcb() to manage your DCB memory by allocating and de-allocating memory for DCB structures. Refer to the "Using FTAM" chapter for recommendations on allocating memory.

ft_didcb()

```
#include %</opt/ftam/include/map.h>
#include %</opt/ftam/include/mapftam.h>
Return_code
ft_didcb (dcb_type, additional_size, dcb_pointer, result)
enum Ft_dcb_type       dcb_type;
Uint32                  additional_size;
Octet                   **dcb_pointer;
Api_rc                  *result;
```

Use ft_didcb() to allocate memory for Ft_xxx_in_dcb or Ft_xxx_out_dcb structures. This function allocates the desired memory at the location pointed to by dcb_pointer.

- When allocating memory for an inout_dcb, you may optionally use the additional_size field to allocate more memory than the size of the DCB structure. All fields that are pointers may need additional memory. You must provide a large enough additional_size to contain all returning output.
- The outcome of ft_didcb() does not return in result if you pass an invalid result structure address on input.

ft_didcb() Parameters

ft_didcb() Parameter	Type	Description
dcb_type	Mandatory Input	Identifies the DCB to initialize
additional_size	Optional Input inout_dcb only	Specifies the amount of memory allocated beyond that allocated for the DCB
dcb_pointer	Input	Address of the DCB to initialize
	Output	Address of the DCB pointer
result	Output	Pointer to the struct Api_rc containing the outcome of the operation: result_code (MAP 3.0 error) and vendor_code (HP–UX—specific error)

ft_dfdcb()

```
#include %</opt/ftam/include/map.h>
#include %</opt/ftam/include/mapftam.h>
Return_code
ft_dfdcb (dcb_pointer, result)
Octet            *dcb_pointer;
Api_rc           *result;
```

Use ft_dfdcb() to de-allocate memory that was allocated by ft_didcb(). Also use ft_dfdcb() to de-allocate memory if you specified NULL for the inout_dcb when calling an FTAM function.

- If you allocated memory (e.g., using malloc()), you cannot call ft_dfdcb() to de- allocate memory.
- The outcome of ft_dfdcb() does not return in result if you pass an invalid result structure address on input.

ft_dfdcb() Parameters

ft_dfdcb() Parameter	Type	Description
dcb_pointer	Mandatory Input	Address of the DCB to free
result	Output	Pointer to the struct Api_rc containing the outcome of the operation: result_code (MAP 3.0 error) and vendor_code (HP–UX—specific error)

em_fdmemory()

```
#include %</opt/ftam/include/map.h>
Return_code
em_fdmemory(memory_pointer, result)
Octet            *memory_pointer;
Api_rc           *result;
```

Use em_fdmemory() to free dynamic memory allocated by em_gperror() for the return_code and vendor_code strings. Note, if you supplied the memory for em_gperror(), do not use em_fdmemory() to free it.

- You may receive unpredictable results if using free() for memory allocated by em_gperror().
- The outcome of em_fdmemory() does not return in result if you pass an invalid result structure address on input.
- If you allocated memory yourself (e.g., using malloc()), you must also free the memory.

em_fdmemory() Parameters

em_fdmemory() Parameter	Type	Description
memory_pointer	Mandatory Input	Points to the beginning of the string; address of the dynamic memory to free (allocated by em_gperror())
result	Output	Pointer to the struct Api_rc containing the outcome of the operation: result_code (MAP 3.0 error) and vendor_code (HP–UX—specific error)

ft_fdmemory()

```
#include %</opt/ftam/include/map.h>
#include %</opt/ftam/include/mapftam.h>
Return_code
ft_fdmemory (memory_pointer, result)
Octet            *memory_pointer;
Api_rc           *result;
```

Use ft_fdmemory() to free dynamic memory allocated for ft_gperror() return_code and vendor_code strings. Note, if you supplied the memory for ft_gperror(), do not use ft_fdmemory() to free it.

- You may receive unpredictable results if using free() for memory allocated by the FTAM library.
- The outcome of ft_fdmemory() does not return in result if you pass an invalid result structure address on input.
- If you allocated memory yourself (e.g., using malloc()), you must also free the memory.

ft_fdmemory() Parameters

ft_fdmemory() Parameter	Type	Description
memory_pointer	Mandatory Input	Points to the beginning of the string; address of the dynamic memory to free (allocated by ft_gperror())
result	Output	Pointer to the struct Api_rc containing the outcome of the operation: result_code (MAP 3.0 error) and vendor_code (HP–UX—specific error)

Responding to Asynchronous Calls

The MAP 3.0 Event Management interface plays a central role in your use of asynchronous calls to FTAM functions.

It is common to have multiple asynchronous function calls outstanding. As responses to these calls come in, the FTAM Service Provider Process (SPP) queues them. The Event Management interface takes the first response off this queue and returns it to the caller as a MAP 3.0 event. At the same time, the Event Management interface updates the called function's inout DCB to show the outcome of the asynchronous call.

The FTAM/9000 implementation of MAP 3.0 Event Management consists of three functions, each used under slightly different circumstances. The functions are:

- em_wait()
- em_hp_select()
- em_hp_sigio()

Whenever possible, use only em_wait() to wait for and obtain MAP events. Since em_wait() is the only one of the three defined by the MAP 3.0 specification, using it eases porting to non-HP platforms. However, em_wait() is also very limited. Sometimes, you may have no alternative but to use one or both proprietary functions instead of or in addition to em_wait().

Following are some guidelines for each of the three event management functions.

When to Use em_wait()

The em_wait() function enables you to suspend application processing until a MAP event occurs. However, em_wait() does not provide for waiting on any non-MAP events.

Use em_wait() when your application needs to wait exclusively on MAP 3.0 events. For example, if your application is a daemon process which interacts only with the OSI network via FTAM protocols.

When to Use em_hp_select()

The em_hp_select() function is a Hewlett-Packard proprietary extension to the MAP 3.0 specification. It can be regarded as a hybrid of the MAP 3.0 em_wait() function and the HP-UX select() system call. It is located in the common MAP library (libmap.a).

Use em_hp_select() instead of em_wait() when your application needs to wait on MAP events, plus non-MAP events that can be represented by a file descriptor and waited on via the HP-UX select() system call. This may be true if your application is interactive (for example, using asynchronous input from Terminal I/O or the X11 Window system). It also may be true if your application needs to communicate with other processes via named pipes or domain sockets as well as perform FTAM operations over the OSI network.

In addition, use em_hp_select() instead of em_wait() if your application would otherwise need em_wait() to return when interrupted by a signal. The em_hp_select() function does not return by itself when interrupted by a signal, but techniques exist to simulate this behavior. See the section on handling signal interrupts with em_hp_select().

When to Use em_hp_sigio()

The em_hp_sigio() function is another Hewlett-Packard proprietary extension in the common MAP library (libmap.a). It enables the Event Management interface to notify your application via the SIGIO signal when there is a MAP 3.0 event pending. However, em_hp_sigio() does not return any MAP events itself. Therefore, it should complement your use of em_wait() or em_hp_select().

Use em_hp_sigio() along with em_wait() or em_hp_select() when your application needs to control the dispatch of MAP and non-MAP components by using signals and/or semaphores to indicate when a particular component has work to do. This is often necessary when porting applications from other operating systems such as AT& T's System V Unix or DEC's VMS.

Using em_wait()

```
#include %</opt/ftam/include/map.h>
Return_code
em_wait (timeout, return_event_name, result)
Em_t                    timeout;
Local_event_name        *return_event_name;
Api_rc                  *result;
```

This section describes general use of asynchronous calls with em_wait(). For additional details on em_wait(), refer to the *HP FTAM/9000 Reference Manual*.

Call functions asynchronously when making multiple requests and when the order in which results are processed does not matter. If you make an asynchronous call, you can perform other operations while your request is being processed. Following are examples of when to call functions asynchronously or synchronously.

- If you cannot call function B before function A completes, you should call function A synchronously.
- If copying a file to four different nodes and the processing order does not matter, you would call ft_copy)) asynchronously and then wait on the return_event_names to know when each ft_copy() completed successfully.

The following text describes the sequence of making asynchronous requests and checking for their successful return from the responder.

1. Submit one or more asynchronous requests, each with a unique return_event_name.
2. Call em_wait() to determine if the requests returned successfully from the responder; you cannot specify the return_event_name for which you want to wait.

   Though em_wait() function waits on multiple asynchronous calls, it returns return_event_names one at a time and in the order that each call completes.
3. Check the inout_dcb of the FTAM function (specified by the return_event_name) to determine the result of a completed request. Note, the inout_dcb pointer and structure are not valid until the em_wait() request returns successfully.

   Since events can return in any order, the return_event_name returned may or may not be the first operation you requested or the one on which you are waiting.

   A return_event_name returns only once. Therefore, you should process the inout_dcb for all return_event_names in the order in which they return or track all the return_event_names that return (for future use).
4. Continue calling em_wait() until you receive the return_event_name you want. If applicable, call em_wait() until all requests are processed.

NOTE

Do not perform any operations on or with an inout_dcb pointer or structure until em_wait() indicates the call using the inout_dcb is complete.

Following is an example of the use of em_wait(). This example creates and opens a file by asynchronously calling ft_bgroup(), ft_create(), and ft_open(), followed by synchronously calling ft_egroup(). These functions were called with return_event_names of 1, 2, 3, and 0, respectively. The em_wait() function waits on these calls.

```
struct Ft_bgroup_out_dcb      *bgr_inout_dcb;
struct Ft_create_out_dcb      *cre_inout_dcb;
struct Ft_open_out_dcb        *ope_inout_dcb;
Em_t                          time;
Local_event_name              return_event_name;
Api_rc                        result;
int                           i;
Return_code                   res;
struct Ft_diagnostic          *diag = NULL;
     /* This loop waits on the three previously submitted
asynchronous calls. */
     for (i = 1; i %<= 3; ++i) {
       time = -1;
       /* Call em_wait() to receive the latest event. */
       res = em_wait(time, & return_event_name, & result);
       if (res != SUCCESS)
          error_handler(result, diag);
       /* Check the result of each function. */
       switch (return_event_name) {
         case 1:
           if (bgr_inout_dcb->result.return_code != SUCCESS)
              error_handler(bgr_inout_dcb->result, diag);
           break;
         case 2:
           if (cre_inout_dcb->result.return_code != SUCCESS)
              error_handler(cre_inout_dcb->result,
                            cre_inout_dcb->diagnostic);
           break;
         case 3:
           if (ope_inout_dcb->result.return_code != SUCCESS)
              error_handler(ope_inout_dcb->result,
                            ope_inout_dcb->diagnostic);
           break;
         default:
           break;
       }
     }
```

Using em_hp_select()

```
#include %</opt/ftam/include/map.h>
Return_code
em_hp_select (timeout, return_event_name, nfds, readfds,
              writefds, exceptfds, result)
Em_t                    timeout;
Local_event_name        *return_event_name
int                     *nfds
unsigned                *readfds
unsigned                *writefds
unsigned                *exceptfds
Api_rc                  *result;
```

This section describes how to use em_hp_select() and provides two program examples. For additional details, refer to the *HP FTAM/9000 Reference Manual*.

NOTE

FTAM events are asynchronous FTAM operations that complete. Non-FTAM events consist of any type of descriptor supported by the select(2) system call that becomes readable or writable, or has exceptions pending.

Multiple asynchronous FTAM functions calls are commonly outstanding at the same time. An application may also need to interact with other processes using an interprocess communication mechanism (for instance, HP-UX Domain Sockets or pipes). It may also require response to asynchronous events from a terminal keyboard or window system (for instance, X- Windows).

The MAP 3.0 Event Management interface does not provide an independent method to wait on both FTAM and non-FTAM events simultaneously. Therefore, HP added a proprietary function—em_hp_select()—to provide this capability.

Neither em_wait() nor em_hp_select() automatically return when interrupted by a signal. However, the following section describes a way to make a signal generate a non-FTAM event, causing em_hp_select() to return on receipt of a signal.

Waiting On FTAM and Non-FTAM Events

Use the em_hp_select() function when an application must simultaneously wait for both an FTAM and a non-FTAM event to occur.

Without em_hp_select(), the application would need to implement a "busy- wait" loop to poll for the FTAM and non-FTAM events. However, this technique is very expensive in terms of CPU utilization, and degrades system performance. This is unacceptable for most real-time or highly interactive applications. Therefore, HP provides em_hp_select() as an alternative method for waiting on both FTAM and non-FTAM events.

The em_hp_select() function suspends processing of the application until an event occurs. While the application is suspended (i.e, blocked), it does not contribute to the demand for CPU time. Therefore, the busy-wait logic can be replaced with the following:

```
em_hp_select(...with indefinite timeout to block until event
occurs...)

handle_event))
```

If you need to wait only on FTAM events, use the em_wait() function. If you need to wait only on non-FTAM events, use the HP–UX select() system call. However, if you need to wait on both types of events simultaneously, use the em_hp_select() function. Any combination of em_wait(), select(), and em_hp_select() within the same program is valid; all three functions are compatible with one another.

The following program example illustrates how to use em_hp_select() to wait on FTAM and non-FTAM events simultaneously. The program reads commands from stdin and starts the requested FTAM operation. The operation is performed asynchronously so that new commands can be read in before the previous operation completes. The operation results are processed as they complete.

This program calls two functions to process the FTAM and non-FTAM events. The logic for these functions is not shown in the example; however, a brief description of each function follows.

read_and_process_command(). This function processes the non-FTAM events by reading and parsing a command line string from stdin. If the command is a "Quit" command, the function returns TRUE to indicate termination. Otherwise, the appropriate FTAM operation is initiated asynchronously. In this case, the function returns FALSE to indicate more commands can be read from stdin.

For example, this function could be a batch entry console for file management. Several file transfers could be started without having to wait for each transfer to complete before starting the next.

map_operation_completed (map_event, map_rc). This function processes the FTAM events by performing some action on the results of the FTAM operation that completed. The operation is identified by the map_event passed as input. If map_rc equals SUCCESS, the inout_dcb for the operation contains the outcome of the operation. Otherwise, the map_rc equals EME032_IPC_ERROR; the operation fails and the inout_dcb does not contain valid information. The specific actions involved with processing a completed FTAM event are specific to the particular event, and could be as simple as logging the results to an output file.

```
#include %<stdio.h>
#include %</opt/ftam/include/map.h>
#define BITS_PER_INT    32
#define SET_MASK(f,fds) (fds)[((f)/BITS_PER_INT)] |=
(1%<%<((f)%BITS_PER_INT))
#define TST_MASK(f,fds) ((fds)[((f)/BITS_PER_INT)] &
(1%<%<((f)%BITS_PER_INT)))
main()
{
 Bool                done;
 Local_event_name    map_event;
 Return_code         map_rc;
 Api_rc              map_result;
 char               *ret_str;
 char               *ven_str;
 int                 nfds;
 unsigned            readfds[2];       /* handles upto 64 fds */
 /* Read and process the first command. No FTAM operations are
 ** outstanding at this time, so do not wait for any to complete.
 */
 done = read_and_process_command();
 /* Wait indefinitely for MAP and non-MAP (i.e., stdin readable) events
 ** to occur. If an EME032_IPC_ERROR occurs, the MAP operation
 ** identified by map_event is treated as having completed with the IPC
 ** error. Non-MAP events can also return in this case, so they
 ** are processed as well.
 **
 ** If any other error occurs, there is a programming error when calling
 ** em_hp_select(); in this case, use em_gperror() and em_fdmemory() to
 ** translate the error into printable character strings, then
 ** abort processing so you can fix the coding error.
 **
 ** Continue processing both FTAM and non-FTAM events until a “Quit”
command
 ** is entered as the non-FTAM event.
 */
```

```
  while ( ! done )
  {
  readfds[0] = 0;
  readfds[1] = 0;
  SET_MASK(stdin, readfds);
  nfds = stdin + 1;
  map_rc = em_hp_select(FOREVER, & map_event, & nfds, readfds, NULL,
NULL,
                        & map_result);
  if ((map_rc == SUCCESS) || (map_rc == EME032_IPC_ERROR))
   {
   if ((map_event != 0))
   map_operation_completed(map_event, map_rc);
   if (TST_MASK(stdin, readfds))
   done = read_and_process_command();
   }
  else
   {
    ret_str = NULL;
    ven_str = NULL;
    map_rc = em_gperror(& map_result, & ret_str, & ven_str, &
map_result);
    if (map_rc == SUCCESS)
     fprintf(stderr, "%s%s", ret_str, ven_str);
    em_fdmemory(ret_str, & map_result);
    em_fdmemory(ven_str, & map_result);
    exit(1);
    }
   } /* while */
/* You finished entering commands, but all of the MAP operations may not
** be complete. Since only MAP events are left, em_wait() is used instead
** of em_hp_select(). An EME002_EXP_EMPTY result indicates all MAP
** operations have completed.
*/
done = FALSE;
do {
 map_rc = em_wait(FOREVER, & map_event, & map_result);
 if ((map_rc == SUCCESS) || (map_rc == EME032_IPC_ERROR))
       map_operation_completed(map_event, map_rc);
 else if (map_rc == EME002_EXP_EMPTY)
  done = TRUE;
 else
  {
  done   = TRUE;
  ret_str = NULL;
  ven_str = NULL;
  map_rc = em_gperror(& map_result, & ret_str, & ven_str, & map_result);
  if (map_rc == SUCCESS)
   fprintf(stderr, "%s%s", ret_str, ven_str);
  em_fdmemory(ret_str, & map_result);
  em_fdmemory(ven_str, & map_result);
  exit(2);
  }
} while ( ! done );
exit(0);
} /* main */
```

Handling Signal Interrupts

Suppose an application needs the em_wait() function to return prematurely if a signal interrupt occurs. One case where this is applicable is when receipt of a signal should cause a new FTAM operation to be initiated or an outstanding operation to be aborted (e.g., the application is being terminated abruptly). Since FTAM functions are not reentrant, the application needs to force em_wait() to return prematurely so the appropriate action can be taken upon receipt of the signal.

The em_wait() and em_hp_select() functions cannot detect signal interrupts and automatically return. However, you can cause em_hp_select() to return when interrupted by a signal. This involves translating the signal interrupt into an em_hp_select() non-FTAM event while executing the signal handler. When em_hp_select() resumes processing after the signal handler completes, the non-FTAM event will be detected and em_hp_select() will return.

Several techniques exist to translate the signal interrupt into an em_hp_select() non-FTAM event. One way is to use an HP–UX pipe as follows:

1. Open the pipe for both reading and writing within the application program.
2. For the expected signals, install a signal handler that writes the trapped signal value to the pipe. This will cause the pipe to become readable.
3. Replace calls to em_wait() (which waits for only FTAM events) with calls to em_hp_select(). Initialize the readfds mask to include the read descriptor for the pipe. If a signal interrupt occurs while executing or blocking within em_hp_select(), the pipe will become readable and cause em_hp_select() to return.
4. After em_hp_select() returns, read the signal value from the pipe so that the notification will be cleared; then take the appropriate action based on the signal value.

The following program example illustrates how to use em_hp_select() and an HP–UX pipe to implement the signal handling technique described previously.

```
#include %<signal.h>
#include %</opt/ftam/include/map.h>
#define BITS_PER_INT    32
#define SET_MASK(f,fds) (fds)[((f)/BITS_PER_INT)] |=
(1%<%<((f)%BITS_PER_INT))
#define TST_MASK(f,fds) ((fds)[((f)/BITS_PER_INT)] &
(1%<%<((f)%BITS_PER_INT)))
#define READ    0
#define WRITE   1
int sig_pipe[2];            /* Pipe r/w descriptors used to queue signals */
void
signal_handler(sigval)
int sigval;
{
    /* Put signal on the pipe to make the pipe readable. This will cause
    ** em_hp_select() to return.
    */
    write(sig_pipe[WRITE], & sigval, sizeof(int));
    /* Perform other signal handling logic if any.  */
}
main()
{
    int                 sigval;         /* The signal value read from pipe  */
    struct sigvec       vec;            /* sigvector for installing handler */
    Local_event_name    map_event;      /* MAP Event Name                   */
    Return_code         map_rc;         /* MAP return code                  */
    Api_rc              map_result;     /* MAP result structure             */
    int                 nfds;           /* File descriptor bound            */
    unsigned            readfds[2];       /* File descriptor mask    */
    /*
    ** Create the HP-UX pipe which is used to translate the signal interrupt
    ** into an em_hp_select() non-MAP event.
    */
    pipe (sig_pipe);
```

```
/* Install the signal handler for the signal you want to trap.  */
 vec.sv_handler = signal_handler;
 vec.sv_mask    = 0;
 vec.sv_flags   = 0;
 sigvector(signal_you_want_to_trap, & vec, NULL);
 /* Initiate the asynchronous FTAM operations. The code for
 ** initiating these operations is not shown in this example.
 */
 /* Wait for a MAP operation to complete or a signal to be caught.
 ** This is done by blocking on both MAP events and the sig_pipe
 ** to become readable.
 */
 readfds[0] = 0;
 readfds[1] = 0;
 SET_MASK(sig_pipe[READ], readfds);
 nfds = sig_pipe[READ] + 1;
 map_rc = em_hp_select(FOREVER, & map_event, & nfds, readfds, NULL, NULL,
                       & map_result);
 if ((map_rc == SUCCESS) || (map_rc == EME032_IPC_ERROR))
     {
     if (map_event != 0)
         {
         /* Process the results of the completed MAP operation. The
         ** code for this function is not shown in this example.
         */
         map_operation_completed(map_event, map_rc);
         }
     if (TST_MASK(sig_pipe[READ], readfds))
         {
         /* em_hp_select() was interrupted by a signal. Remove the signal
         ** value from the pipe to clear the interrupt notification.
         */
         read(sig_pipe[READ], & sigval, sizeof(int));
         /* Perform the application specific logic to be done when
         ** em_hp_select() unblocks because of a signal.
         */
         }
     }
 else
     {
     /* Handle the em_hp_select() error. See Example 1.  */
     }
```

Using em_hp_sigio()

```
#include %</opt/ftam/include/map.h>
Return_code
em_hp_sigio (action, pid, result)
Unit32                    action;
Sint32                    pid;
Api_rc                    *result;
```

This section describes how to use em_hp_select() and provides a program example. For additional details, refer to the *HP FTAM/9000 Reference Manual*.

Use em_hp_sigio() to enable the MAP Event Management interface to generate SIGIO signals whenever an asynchronous MAP event is pending. Unlike the other MAP event management functions, em_hp_sigio() does not return a MAP event to the caller. Instead, it merely puts the MAP event management interface into an extended capability mode.

By using this capability, you can suspend the processing of your application until any of a variety of signals or semaphore operations cause your application to resume execution. Then, only after the SIGIO signal has been received do you need to call em_wait() to obtain the MAP event that is pending. Furthermore, since you know the MAP event is already pending, you can call em_wait() with a zero timeout to obtain the event and return immediately.

The following program example illustrates one possible use of em_hp_sigio(). The program initiates and processes two types of events: MAP events in the form of FTAM and/or FTAM asynchronous operations, and Non-MAP events that take the form of SIGUSR1 signals. The em_hp_sigio() function is used to enable SIGIO signal notification in the MAP Event Management interface, and em_wait() is used to process the MAP event after SIGIO is caught.

```
/*
**                    Sample program for em_hp_sigio()
**
** This program is designed with three primary components:
**
**      *  a central control/dispatch component
**      *  a MAP event processing component
**      *  a Non-MAP event processing component
**
** The central control/dispatch component makes use of an array of semaphores
** to manage program suspension and resumption, and to keep track of which
** components (MAP or Non-MAP) have work to do. Additionally, a signal
** handler is installed for the MAP and Non-MAP generated signals which
** manipulates the semaphore array. The SIGIO signal is used to notify the
** control/dispatch component that a MAP event needs to be processed, and the
** SIGUSR1 signal is used for Non-MAP events.
**
** The MAP and Non-MAP processing components are referenced as external
** functions. Details of these components are specific to each application
** and are, therefore, not included here. Note, calling em_wait() to obtain
** the MAP event would normally be included in the MAP specific processing
** component, but em_wait() is pulled out into the main component here to
** demonstrate the relationship between em_hp_sigio() and em_wait().
*/
#include %<stdio.h>
#include %<errno.h>
#include %<signal.h>
#include %<sys/types.h>
#include %<sys/ipc.h>
#include %<sys/sem.h>
#include %</opt/ftam/include/map.h>
/*
** Functions and variables not provided by the demonstration program.
*/
extern Bool operations_to_wait_on_and_process;
extern void initiate_MAP_operation();
extern void process_MAP_operation();
extern void initiate_NON_MAP_operation();
extern void process_NON_MAP_operation();
/*
** Semaphores used to manage suspend/resume activity
**
** Three semaphores are used to manage the MAP and Non-MAP asynchronous
** activity. One semaphore is used to control the suspension and resumption
** of process. Another semaphore is used to keep track of the number of
** pending events for each event type, MAP and Non-MAP in this case.
**
** The semaphores are operated on by a set of functions included following
** the main program. The functions provide logical P and V operations on a
** set of semaphores, based on HP-UX semaphore operations (system calls).
*/

#define NUM_SEMAPHORES 3
#define SEM_CONTROL     1       /* Used for suspend &  resume control      */
#define SEM_MAP         2       /* Used to track pending MAP events        */
#define SEM_NON_MAP     4       /* Used to track pending Non-MAP events    */
```

```
#define WAIT            0       /* Tells sem_p)) to block if necessary     */
#define NO_WAIT         1       /* Tells sem_p() to return immediately     */
int  sem_id;                    /* The semaphore array for async mgmt      */
int  sem_create();              /* Create semaphores on the system         */
void sem_remove();              /* Remove semaphores from the system       */
int  sem_p();                   /* Perform a P (get) operation             */
void sem_v();                   /* Perform a V (give) operation            */
/*
** Signals and signal handler used to manage asynchronous event notification.
** The signal_handler logic is included following the main program.
*/
#define SIG_MAP         SIGIO   /* MAP notification signal                 */
#define SIG_NON_MAP     SIGUSR1 /* Non-MAP signal (for example)            */
void signal_handler();          /* Signal handler for async event mgmt     */
/*
**                              MAIN PROGRAM
*/
main()
{
    Local_event_name    map_event_name; /* MAP 3.0 event name (identifier) */
    Return_code         map_rc;         /* MAP 3.0 function return code    */
    Api_rc              map_result;     /* MAP 3.0 result structure        */
    struct sigvec       vec;            /* Signal Vector for event handler */
    printf("Demonstration program for em_hp_sigio()\n");
    /*
    ** Create and initialize the semaphore array for process suspension and
    ** resumption.
    */
    printf("Creating semaphore for process suspend &  resume.\n");
    sem_id = sem_create(NUM_SEMAPHORES);
    /*
    ** Install the signal handler to catch interrupts for each signal used
    ** as an event notification.
    */
    printf("Installing signal handlers for MAP and Non-MAP events\n");
    vec.sv_handler = signal_handler;
    vec.sv_mask    = 0;
    vec.sv_flags   = 0;
    sigvector(SIGIO,   & vec, NULL);   /* MAP events                    */
    sigvector(SIGUSR1, & vec, NULL);   /* Non-MAP events                */
    /*
    ** Put the MAP 3.0 Interface into SIGIO notification mode. This causes
    ** MAP Event Management to generate a SIGIO signal whenever there is
    ** an asynchronous event to process.
    **
    ** Note, the process to signal is the local (this) process. The process
    ** id is negated to distinguish it from a process group id.
    */
    printf("Calling em_hp_sigio() to enable SIGIO notification for MAP.\n");
    map_rc = em_hp_sigio(EM_SIGIO_ENABLE, getpid(), & map_result);
    if (map_rc != SUCCESS)
    {
        fprintf(stderr, "ERROR: em_hp_sigio(ENABLE) failed, %d\n", map_rc);
        exit(1);
    }
```

```
/*
** Activate MAP 3.0 Application Entity for FTAM or FTAM, then initiate
** asynchronous MAP 3.0 operations.
*/
initiate_MAP_operation();
/*
** Initialize and initiate Non-MAP asynchronous operations.
*/
initiate_NON_MAP_operation();
while (operations_to_wait_on_and_process)
{
    /*
    ** Suspend processing until an asynchronous event occurs.
    */
    printf("\nSuspending processing until an event occurs.\n");
    sem_p(sem_id, SEM_CONTROL, WAIT);
    /*
    ** Processing has resumed. Determine the event type that occurred.
    */
    printf("Resuming processing after semaphore popped.\n");
    /*
    ** Process MAP 3.0 (FTAM or FTAM) event if one is pending.
    **
    ** A non-blocking sem_p() operation is used to atomically test and
    ** decrement the pending MAP event count. If a MAP event is pending,
    ** sem_p() returns zero; otherwise, it returns non-zero.
    **
    ** Note, calling em_hp_sigio() earlier merely put the MAP interface
    ** into SIGIO notification mode. You must still call em_wait() to
    ** obtain the event name for the MAP 3.0 operation that triggered
    ** the signal notification. Furthermore, the operation may only be
    ** partially complete. Calling em_wait() processes the MAP event as
    ** much as possible, but returns EME005_TIMEOUT if the event is not
    ** completely processed.
    */
    if (sem_p(sem_id, SEM_MAP, NO_WAIT) == 0)
    {
        printf("Calling em_wait() to obtain MAP event.\n");
        map_rc = em_wait(0, & map_event_name, & map_result);
        if (map_rc == SUCCESS)
            process_MAP_operation(map_event_name);
        else if (map_rc == EME005_TIMEOUT)
            printf("em_wait timeout: operation partially complete\n");
        else
            fprintf(stderr, "ERROR: em_wait() failed, %d\n", map_rc);
    }
```

```
        /*
        ** Process Non-MAP event if one is pending.
        **
        ** A non-blocking sem_p() operation is used to atomically test and
        ** decrement the pending Non-MAP event count. If a Non-MAP event is
        ** pending, sem_p() returns zero; otherwise, it returns non-zero.
        **
        ** Note, event processing is specific to your own application;
        ** details are not included in this example.
        */
        if (sem_p(sem_id, SEM_NON_MAP, NO_WAIT) == 0)
        {
            process_NON_MAP_operation();
        }
    } /* while - operations to process */
    /*
    ** Disable SIGIO notification for the MAP 3.0 Interface.
    ** Note, the process id parameter is ignored so any value is fine.
    */
    printf("\nCalling em_hp_sigio() to disable SIGIO notification.\n");
    map_rc = em_hp_sigio(EM_SIGIO_DISABLE, 0, & map_result);
    if (map_rc != SUCCESS)
        fprintf(stderr, "ERROR: em_hp_sigio(DISABLE) failed, %d\n", map_rc);

    /*
    ** Remove semaphore resources.
    */
    printf("Cleaning up semaphore resources.\n");
    sem_remove(sem_id);
    exit(0);
} /* end main() */
/*
**                    Signal Handler for Event Notification
**
** The event notification signal handler performs a semaphore V operation
** on the suspend/resume semaphore, plus the specific event type semaphore.
*/
void
signal_handler(sig)
int sig;
{
    unsigned long sem_mask;
    printf("Signal handler taken for signal %d\n", sig);
    /*
    ** Always included the Control semaphore in the semaphore mask. This is
    ** what causes the main program to resume execution.
    */
    sem_mask = SEM_CONTROL;
```

```
    /*
    ** Determine the event type based on the signal received.
    ** Update the semaphore mask to include the event type specific
    ** semaphore.
    */
    if (sig == SIG_MAP)
        sem_mask |= SEM_MAP;
    else if (sig == SIG_NON_MAP)
        sem_mask |= SEM_NON_MAP;
    else {
        fprintf(stderr, "ERROR: unsupported signal, %d\n", sig);
        exit(1);
    }
    /*
    ** Perform a V (give) operation on the specified semaphores so that the
    ** process can resume (if suspended), and the event count for the given
    ** type is incremented atomically.
    */
    sem_v(sem_id, sem_mask);
} /* signal_handler */
/*
**                                sem_create()
**
** This function creates a semaphore array for the specified number of
** semaphores (up to 32) and initializes them to an "unblocked" state.
*/
int
sem_create(sem_cnt)
int sem_cnt;
{
    int         sem_id;
    ushort      sem_val[sizeof(unsigned long)];
    sem_id = semget(IPC_PRIVATE, sem_cnt, IPC_CREAT | 0600);
    if (sem_id == -1)
    {
        fprintf(stderr, "ERROR: creating semaphore, errno %d\n", errno);
        exit(1);
    }
    memset(sem_val, 0, sizeof(sem_val));
    if (semctl(sem_id, 0, SETALL, sem_val) == -1)
    {
        fprintf(stderr, "ERROR: initializing semaphore, errno %d\n", errno);
        exit(1);
    }
    return(sem_id);
}
```

```
/*
**                              sem_remove()
**
** This function removes the semaphore array from the system.
*/
void
sem_remove(sem_id)
int sem_id;
{
    if (semctl(sem_id, 0, IPC_RMID, 0) == -1)
    {
        fprintf(stderr, “ERROR: removing semaphore, errno %d\n”, errno);
        exit(1);
    }
}
/*
**                                sem_p()
**
** This function performs a semaphore P (get) operation on the set of
** semaphores specified by 'sem_mask'.   The sem_mask is defined such that
** semaphore number N is represented by bit (1 %< (N-1)) in the mask.
**
** If the 'sem_nowait' flag is FALSE, processing is suspended until blocking
** conditions for all of the specified semaphores have cleared.
** If the 'sem_nowait' flag is TRUE, processing continues immediately and the
** return value indicates whether a blocking condition exists or not.
**
** If all blocking conditions are cleared, the function returns zero.
** Otherwise, non-zero returns.
*/
int
sem_p(sem_id, sem_mask, sem_nowait)
int           sem_id;
unsigned long sem_mask;
int           sem_nowait;
{
    struct sembuf       sem_ops[sizeof(unsigned long)];
    int                 sem_num = 0;
    int                 sem_cnt = 0;
    int                 rc      = 0;
    while ((sem_num %< sizeof(unsigned long)) & &  sem_mask)
    {
        if (sem_mask &  1)
        {
            sem_ops[sem_cnt].sem_num  = sem_num;
            sem_ops[sem_cnt].sem_op   = -1;
            sem_ops[sem_cnt].sem_flg  = (sem_nowait ? IPC_NOWAIT : 0);
            sem_cnt++;
        }
        sem_num++;
        sem_mask >= 1;
    }
```

```
    if (sem_cnt > 0)
    {
        do {
            rc = semop(sem_id, sem_ops, sem_cnt);
        } while ((rc == -1) & &  (errno == EINTR));
        if ((rc == -1) & &  !((sem_nowait) & &  (errno == EAGAIN)))
        {
            fprintf(stderr, “ERROR: semaphore P (get), errno %d\n”, errno);
            exit(1);
        }
    }
    return(rc);
} /* sem_p */
/*
**                                sem_v()
**
** This function performs a semaphore V (give) operation on the set of
** semaphores specified by 'sem_mask'.   The sem_mask is defined such that
** semaphore number N is represented by bit (1 %< (N-1)) in the mask.
*/
void
sem_v(sem_id, sem_mask)
int           sem_id;
unsigned long sem_mask;
{
    struct sembuf       sem_ops[sizeof(unsigned long)];
    int                 sem_num = 0;
    int                 sem_cnt = 0;
    int                 rc;
    while ((sem_num %< sizeof(unsigned long)) & &  sem_mask)
    {
        if (sem_mask &  1)
        {
            sem_ops[sem_cnt].sem_num  = sem_num;
            sem_ops[sem_cnt].sem_op   = 1;
            sem_ops[sem_cnt].sem_flg  = 0;
            sem_cnt++;
        }
        sem_num++;
        sem_mask >= 1;
    }

    if (sem_cnt > 0)
    {
        do {
            rc = semop(sem_id, sem_ops, sem_cnt);
        } while ((rc == -1) & &  (errno == EINTR));

        if (rc == -1)
        {
            fprintf(stderr, “ERROR: semaphore V (give), errno %d\n”, errno);
            exit(1);
        }
    }
} /* sem_v */
```

Translating Error Messages

FTAM and Event Management functions return Return_codes.

- To translate errors returned by Event Management to character strings, invoke em_gperror().
- To translate errors return by FTAM functions to character strings, invoke ft_gperror().

em_gperror()

```
#include %</opt/ftam/include/map.h>
Return_code
em_gperror(input_result, return_string, vendor_string, result)
Api_rc                *input_result;
Octet                 **return_string;
Octet                 **vendor_string;
Api_rc                *result;
```

The em_gperror() function translates the input_result structure from Event Management functions to character strings, as follows:

- The input_result->return_code is translated to a character string called return_string.
- The input_result->vendor_code is translated to a character string called vendor_string.
- If the address that the return_string points to is NULL, the interface automatically allocates the required memory. After em_gperror() returns, you must use em_fdmemory() to free the memory. Do not use free() to deallocate memory allocated by FTAM.
- If the address that the return_string points to is not NULL, the value must be the address of the memory that was previously allocated. The specified data area must be large enough to hold a 256-byte string (including the NULL-terminator).
- You may receive unpredictable results if using free() for memory allocated by em_gperror().

em_gperror() Parameters

em_gperror() Parameter	Type	Description
input_result	Mandatory Input	Pointer to the Api_rc structure containing information to translate: return_code (MAP 3.0 error) and vendor_code (HP– UX—specific error)
return_string	Mandatory Input	Address of where to place the character string for input_result->return_code
	Output	Address of the return_code character string; this string is NULL terminated and already contains the NEW LINE character
vendor_string	Optional Input	Address of where to place the character string for input_result->vendor_string
	Output	Address of the vendor_code character string; this string is NULL terminated and already contains the NEW LINE character
result	Output	Pointer to the Api_rc structure containing outcome of the operation: return_code (MAP 3.0 error) and vendor_code (HP–UX—specific error)

ft_gperror()

```
#include %</opt/ftam/include/map.h>
Return_code
ft_gperror (input_result, return_string, vendor_string, result)
Api_rc                *input_result;
Octet                 **return_string;
Octet                 **vendor_string;
Api_rc                *result;
```

The ft_gperror() function translates the input_result structure from FTAM functions to character strings, as follows:

- The input_result->return_code is translated to a character string called return_string.
- The input_result->vendor_code is translated to a character string called vendor_string.
- If the address that the return_string points to is NULL, the interface automatically allocates the required memory. After ft_gperror() returns, you must use ft_fdmemory() to free the memory.

NOTE Do not use free() to deallocate memory allocated by FTAM.

- If the address that the return_string points to is not NULL, you must allocate the memory. The specified data area must be large enough to hold a 256-byte string (including the NULL-terminator).

ft_gperror() Parameters

ft_gperror() Parameter	Type	Description
input_result	Mandatory Input	Pointer to the Api_rc structure containing information to translate: return_code (MAP 3.0 error) and vendor_code (HP– UX—specific error)
return_string	Mandatory Input	Address of where to place the character string for input_result->return_code
	Output	Address of the return_code character string; this string is NULL terminated and already contains the NEW LINE character
vendor_string	Optional Input	Address of where to place the character string for input_result->vendor_string
	Output	Address of the vendor_code character string; this string is NULL terminated and already contains the NEW LINE character
result	Output	Pointer to the Api_rc structure containing outcome of the operation: return_code (MAP 3.0 error) and vendor_code (HP–UX—specific error)

Determining Available Resources

While sending data, limited flow control resources may prevent the operation from completing. This circumstance is indicated by the error FTE008_NO_CON_RESOURCES returning on ft_sdata() function calls. To determine when the resource clears, call ft_nwcleared().

ft_nwcleared()

```
#include %</opt/ftam/include/map.h>
#include %</opt/ftam/include/mapftam.h>
Return_code
ft_nwcleared (connection_id, local_event_name, inout_dcb)
Connection_id                   connection_id;
Local_event_name                local_event_name;
struct Ft_nwcleared_out_dcb     **inout_dcb;
```

Use ft_nwcleared() to determine when the FTE008_NO_CON_RESOURCES error condition (on ft_sdata()) clears and there are enough resources to continue.

- The ft_nwcleared() connection_id must be the same as the connection that returned the FTE008_NO_CON_RESOURCES error.
- If you invoke ft_nwcleared() synchronously, the function does not return until a resource is acquired. Though resources clear, there is no guarantee they will be available for a subsequent ft_sdata() request.
- If you invoke ft_nwcleared() asynchronously, you cannot call other functions on that connection_id until the ft_nwcleared() is noted by em_wait(). If you call another function before ft_nwcleared() is noted, you are not informed when the resource is available (i.e., the ft_nwcleared() is revoked).
- When calling ft_sdata() a second time, all parameters must be the same as those of the initial ft_sdata() request.

EXAMPLE: This example shows the use of ft_nwcleared(). The connection_id and data_unit parameters were previously set.

```
Connection_id                  connection_id;
struct Ft_data_unit            data_unit;
Local_event_name               sda_event_name, nwc_event_name;
struct Ft_sdata_out_dcb        *sda_inout_dcb;
struct Ft_nwcleared_out_dcb    *nwc_inout_dcb;
Result_code                    res;

sda_event_name = 1;
sda_inout_dcb = NULL;
res = ft_sdata(connection_id, & data_unit, sda_event_name, & sda_inout_dcb);
if (res == FTE008_NO_CON_RESOURCES) {
   nwc_event_name = 0;
   nwc_inout_dcb = NULL;
   res = ft_nwcleared(connection_id, nwc_event_name, & nwc_inout_dcb);
   if (res == SUCCESS) {
      res = ft_sdata(connection_id, & data_unit, sda_event_name,
                     & sda_inout_dcb);
   }
}
```

ft_nwcleared() Parameters

ft_nwcleared() Parameter	Type	Description
connection_id	Mandatory Input	Uniquely identifies a specific connection to the filestore
local_event_name	Mandatory Input	If the call is asynchronous, uniquely identifies the function call; if the call is synchronous, the value is 0 (zero)
inout_dcb.size	Mandatory input if using inout_dcb	Size (in Octets) of the inout_dcb structure and data
inout_dcb.result	Output	Pointer to the struct Api_rc containing the outcome of the operation: result_code (MAP 3.0 error) and vendor_code (HP–UX—specific error)

5 Using High Level, Context Free Functions

High level functions simplify FTAM programming by performing a series of low level functions for you. Since the high level functions described in this chapter are context free, you can use them at any time. Applications written with high level, context free (HLCF) functions are smaller, easier to write, and less prone to error.

Refer to the “Example Programs” chapter for model programs using the HLCF functions.

Chapter Overview

This chapter describes the following HLCF functions in the order listed.

Task to Perform	Function Used to Perform the Task	Description
Copying and Moving FTAM Files	ft_fcopy() ft_fcopy_aet()	Copy files
	ft_fmove_aet() ft_fmove()	Move files
Reading and Changing Attributes	ft_frattributes() ft_frattributes_aet()	Read attributes
	ft_fcattributes() ft_fcattributes_aet()	Change attributes
Deleting Files	ft_fdelete() ft_fdelete_aet()	Delete files

NOTE This chapter does not explain the parameter structures. For detailed structure information (parameter settings), refer to the “FTAM Data Structures” chapter.

Copying and Moving FTAM Files (HLCF)

Use ft_fcopy() and ft_fcopy_aet() to copy files, and ft_fmove() and ft_fmove_aet() to move files with only one call. Since copying or moving files using low level calls requires most FTAM functions, you can save significant coding time and effort using ft_fcopy(), ft_fcopy_aet(), ft_fmove(), and ft_fmove_aet().

ft_fcopy()

```
#include %</opt/ftam/include/map.h>
#include %</opt/ftam/include/mapftam.h>
Return_code
ft_fcopy(source_dirname, source_filename, destination_dirname,
          destination_filename, ae_label, return_event_name,
          input_dcb, inout_dcb)
Ae_dir_name                              source_dirname;
Ft_filename                              source_filename;
Ae_dir_name                              destination_dirname;
Ft_filename                              destination_filename;
Ae_label                                 *ae_label;
Local_event_name                         return_event_name;
struct Ft_fcopy_in_dcb                   *input_dcb;
struct Ft_fcopy_out_dcb                  **inout_dcb;
```

The ft_fcopy() function copies one FTAM file (contents and attributes) to another FTAM file. The original file remains in tact. The new file contains the source file attributes and those attributes that are automatically set (e.g., filesize).

- If the file you are copying to already exists, the outcome depends on how you set input_dcb->overwrite. If input_dcb->overwrite is set to FT_RECREATE_FILE, FTAM copies the source file over the existing destination file. If the value is FT_DONT_RECREATE_FILE, FTAM does not copy the source file over the existing file, the function fails, and you receive an error message.

NOTE The following points do not apply to HP–UX FTAM responders. HP–UX FTAM responders do not use these fields. The information is provided here because other implementations may use these fields.

- If the file has access control elements, and an identity field matches the source_init_id, the input_dcb->src_concur_cntl must be a subset of the values stored in the conc_access field of struct Ft_access_control_element.
- If the file has access control elements, and an identity field matches the dest_init_id, the input_dcb->dest_concur_cntl must be a subset of the values stored in the conc_access field of struct Ft_access_control_element.
- You must supply matching passwords in input_dcb->source_file_passwords for FT_FA_READ and FT_FA_READ_ATTRIBUTE file actions if the following conditions exist.
  - If the file you are copying from contains an identity (in Ft_access_control_element) that matches the source_init_id AND
  - If passwords exist for these file actions
- You must supply matching passwords in input_dcb->dest_file_passwords if the file you copying to exists and contains an identity (in Ft_access_control_element) that matches the dest_init_id and if passwords exist for these file actions.
  - If the file is an FTAM-1, FTAM-3, or INTAP-1 document type, you must supply matching passwords for FT_FA_DELETE_FILE and FT_FA_REPLACE.
  - If the file is an FTAM–2 document type, you must supply matching passwords for FT_FA_DELETE_FILE and FT_FA_INSERT.

Ft_fcopy_in_dcb

```
struct  Ft_fcopy_in_dcb {
        Ft_initiator_identity           source_init_id;
        Ft_single_file_pw               source_filestore_pw;
        Ft_account                      source_account;
        struct  Ft_file_passwords       source_file_passwords;
        Ft_initiator_identity           dest_init_id;
        Ft_single_file_pw               dest_filestore_pw;
        Ft_account                      dest_account;
        struct  Ft_file_passwords       dest_file_passwords;
        Ft_single_file_pw               create_file_pw;
        enum Ft_delete_overwrite        overwrite;
        struct Ft_concurrency_control   *src_concur_cntl;
        struct Ft_concurrency_control   *dest_concur_cntl;
};
```

Ft_fcopy_out_dcb

```
struct  Ft_fcopy_out_dcb   {
        Uint32                      size;
        struct Api_rc               result;
        enum    Ft_action_result    action_result;
        struct  Ft_attributes       attributes;
        struct  Ft_charging         *charging;
        struct  Ft_diagnostic       *diagnostic;
};
```

ft_fcopy() Parameters

ft_fcopy() Parameter	Type	Description
source_dirname	Optional Input	Directory distinguished name of the source filestore; NULL implies local filestore
source_filename	Mandatory Input	Path name of the file you are copying; must be in the syntax of the real filestore
destination_dirname	Optional Input	Directory distinguished name of the destination filestore; NULL implies local filestore
destination_filename	Optional Input	Path name of the file to which you are copying; NULL implies source_filename; must be in the syntax of the real filestore
ae_label	Mandatory Input	Unique identifier of ftam_init you want to service the request; if pointing to a NULL location, the interface uses a currently activated ftam_init or activates and deactivates a ftam_init
	Output	Unique identifier for ftam_init that serviced the request
return_event_name	Mandatory Input	If the call is asynchronous, uniquely identifies the function call; if the call is synchronous, the value is 0 (zero)
input_dcb-> source_init_id	Optional Input	Source login account

ft_fcopy() Parameter	Type	Description
input_dcb-> source_filestore_pw	Optional Input	Login password for the source_init_id account
input_dcb-> source_account	Optional Input	Identifies who is responsible for accumulated storage charges on source file; HP–UX responders accept, but ignore, this value.
input_dcb-> source_file_passwords	Optional Input (Used only with non-HP-UX responders.)	Structure containing the passwords for FT_FA_READ and FT_FA_READ_ATTRIBUTE. Set source_file_passwords only if the file you are copying from has an identity (in Ft_access_control_element) that matches source_init_id and if passwords exist for these two actions
input_dcb- >dest_init_id	Optional Input	Destination login account
input_dcb-> dest_filestore_pw	Optional Input	Login password for the dest_init_id account
input_dcb-> dest_account	Optional Input	Identifies who is responsible for accumulated storage charges on destination file; HP–UX responders accept, but ignore, this value.
input_dcb-> dest_file_passwords	Optional Input (Used only with non-HP-UX responders.)	Structure containing the passwords for the actions FT_FA_DELETE_FILE (FTAM-1, FTAM-2, FTAM-3, INTAP-1), FT_FA_INSERT (FTAM-2), and FT_FA_REPLACE (FTAM-1, FTAM-3, INTAP-1). Set dest_file_passwords only if the file has an identity (in Ft_access_control_element) that matches dest_init_id and if passwords exist for these actions
input_dcb-> create_file_pw	Optional Input	Establishes permission to create files in the destination filestore
input_dcb->overwrite	Optional Input	Determines action taken if the destination file exists

ft_fcopy() Parameter	Type	Description
input_dcb-> src_concur_cntl	Optional Input (Used only with non-HP-UX responders.)	Sets the concurrency control for source_filename; compared to conc_access in struct Ft_access_control_element if an identity field matches the source_init_id
input_dcb-> dest_concur_cntl	Optional Input (Used only with non-HP-UX responders.)	Sets the concurrency control for destination_filename; compared to conc_access in struct Ft_access_control_element if an identity field matches the dest_init_id
inout_dcb->size	Mandatory input if using inout_dcb	Size (in Octets) of the inout_dcb structure and data
inout_dcb->result	Output	Pointer to the struct Api_rc containing the outcome of the operation: result_code (MAP 3.0 error) and vendor_code (HP–UX—specific error)
inout_dcb-> action_result	Output	Specifies the overall success or failure of the request
inout_dcb->attributes	Output	Contains values of the attributes that uniquely identify the destination file
inout_dcb->charging	Output	HP–UX responders do not use charging, though it may contain information from other responders
inout_dcb->diagnostic	Output	Provides ISO-specific error information

ft_fmove()

```
#include %</opt/ftam/include/map.h>
#include %</opt/ftam/include/mapftam.h>
Return_code
ft_fmove(source_dirname, source_filename, destination_dirname,
          destination_filename, ae_label, return_event_name,
          input_dcb, inout_dcb)
Ae_dir_name                              source_dirname;
Ft_filename                              source_filename;
Ae_dir_name                              destination_dirname;
Ft_filename                              destination_filename;
Ae_label                                 *ae_label;
Local_event_name                         return_event_name;
struct Ft_fmove_in_dcb                   *input_dcb;
struct Ft_fmove_out_dcb                  **inout_dcb;
```

The ft_fmove() function moves a file from one filestore to another (i.e., moves source_filename in the source_dirname filestore to destination_filename in the destination_dirname filestore). The new file contains the source file attributes and those attributes that are automatically set (e.g., filesize).

- If the file you are moving to already exists, the outcome depends on how you set input_dcb->overwrite. If input_dcb->overwrite is set to FT_RECREATE_FILE, FTAM copies the source file over the existing destination file. If the value is FT_DONT_RECREATE_FILE, FTAM does not copy the source file over the existing file, the function fails, and you receive an error.

NOTE

The following points do not apply to HP–UX FTAM responders. HP–UX FTAM responders do not use these fields. The information is provided here because other implementations may use these fields.

- If the file has access control elements, and an identity field matches the source_init_id, the input_dcb->src_concur_cntl must be a subset of the values in the conc_access field of the access control element.
- If the file has access control elements, and an identity field matches the dest_init_id, the input_dcb->dest_concur_cntl must be a subset of the values in the conc_access field of the access control element.

- You must supply matching passwords in input_dcb->source_file_ passwords for FT_FA_READ, FT_FA_READ_ATTRIBUTE, and FT_FA_DELETE_FILE file actions if the following conditions exist.
  - If the file you are moving contains an identity (in Ft_access_control_element) that matches the source_init_id AND
  - If passwords exist for these file actions
- You must supply matching passwords in input_dcb->dest_file_passwords if the file you moving to exists and contains an identity (in Ft_access_control_element) that matches the dest_init_id and if passwords exist for these file actions.
  - If the file is an FTAM–1, FTAM–3, or INTAP-1 document type, you must supply matching passwords for FT_FA_DELETE_FILE and FT_FA_REPLACE.
  - If the file is an FTAM–2 document type, you must supply matching passwords for FT_FA_DELETE_FILE and FT_FA_INSERT.

Ft_fmove_in_dcb

```
struct  Ft_fmove_in_dcb {
        Ft_initiator_identity           source_init_id;
        Ft_single_file_pw               source_filestore_pw;
        Ft_account                      source_account;
        struct  Ft_file_passwords       source_file_passwords;
        Ft_initiator_identity           dest_init_id;
        Ft_single_file_pw               dest_filestore_pw;
        Ft_account                      dest_account;
        struct  Ft_file_passwords       dest_file_passwords;
        Ft_single_file_pw               create_file_pw;
        enum Ft_delete_overwrite        overwrite;
        struct Ft_concurrency_control   *src_concur_cntl;
        struct Ft_concurrency_control   *dest_concur_cntl;
};
```

Ft_fmove_out_dcb

```
struct  Ft_fmove_out_dcb {
        Uint32                      size;
        struct Api_rc               result;
        enum    Ft_action_result    action_result;
        struct  Ft_attributes       attributes;
        struct  Ft_charging         *charging;
        struct  Ft_diagnostic       *diagnostic;
};
```

ft_fmove() Parameters

ft_fmove() Parameter	Type	Description
source_dirname	Optional Input	Directory distinguished name of the source filestore; NULL implies local filestore
source_filename	Mandatory Input	Path name of the file you are moving; must be in the syntax of the real filestore
destination_dirname	Optional Input	Directory distinguished name of the destination filestore; NULL implies local filestore
destination_filename	Optional Input	Path name of the file to which you are moving; NULL implies source_filename; must be in the syntax of the real filestore
ae_label	Mandatory Input	Uniquely identifier of ftam_init you want to service the request; if pointing to a NULL location, the interface uses a currently activated ftam_init or activates and deactivates a ftam_init
	Output	Uniquely identifier for ftam_init that serviced the request
return_event_name	Mandatory Input	If the call is asynchronous, uniquely identifies the function call; if the call is synchronous, the value is 0 (zero)
input_dcb-> source_init_id	Optional Input	Source login account
input_dcb-> source_filestore_pw	Optional Input	Login password for the source_init_id account
input_dcb-> source_account	Optional Input	Identifies who is responsible for accumulated storage charges on source file; HP–UX responders accept, but ignore this value

ft_fmove() Parameter	Type	Description
input_dcb-> source_file_passwords	Optional Input (Used only with non—HP–UX responders.)	Structure containing the passwords for FT_FA_READ, FT_FA_READ_ATTRIBUTE, and FT_FA_DELETE_FILE. Set source_file_passwords only if the file you are moving has an identity (in Ft_access_control_element) that matches source_init_id and if passwords exist for these three actions
input_dcb-> dest_init_id	Optional Input	Destination login account
input_dcb-> dest_filestore_pw	Optional Input	Login password for the dest_init_id account
input_dcb-> dest_account	Optional Input	Identifies who is responsible for accumulated storage charges on destination file; HP–UX responders accept, but ignore, this value
input_dcb-> dest_file_passwords	Optional Input (Used only with non-HP-UX responders.)	Structure containing the passwords for the actions FT_FA_DELETE_FILE (FTAM-1, FTAM-2, FTAM-3, INTAP-1), FT_FA_INSERT (FTAM-2), and FT_FA_REPLACE (FTAM-1, FTAM-3, INTAP-1). Set dest_file_passwords only if the file has an identity (in Ft_access_control_element) that matches dest_init_id, and if passwords exist for these actions
input_dcb-> create_file_pw	Optional Input	Establishes permission to create files in the destination filestore
input_dcb->overwrite	Optional Input (Used only with non—HP–UX responders.)	Determines action taken if the destination file exists

ft_fmove() Parameter	Type	Description
input_dcb-> src_concur_cntl	Optional Input (Used only with non—HP–UX responders.)	Sets the concurrency control for source_filename; compared to conc_access in struct Ft_access_control_element if an identity field matches the source_init_id
input_dcb-> dest_concur_cntl	Optional Input (Used only with non—HP–UX responders.)	Sets the concurrency control for destination_filename; compared to conc_access in struct Ft_access_control_element if an identity field matches the dest_init_id
inout_dcb->size	Mandatory input if using inout_dcb	Size (in Octets) of the inout_dcb structure and data
inout_dcb->result	Output	Pointer to the struct Api_rc containing the outcome of the operation: result_code (MAP 3.0 error) and vendor_code (HP–UX—specific error)
inout_dcb-> action_result	Output	Specifies the overall success or failure of the request
inout_dcb->attributes	Output	Contains values of the attributes that uniquely identify the destination file
inout_dcb->charging	Output	HP–UX responders do not use charging, though it may contain information from other responders
inout_dcb->diagnostic	Output	Provides ISO-specific error information

ft_fcopy_aet

```
#include %</opt/ftam/include/map.h>
#include %</opt/ftam/include/mapftam.h>
Return_code
ft_fcopy_aet(source_ascii_ddn, source_filename,
            destination_ascii_ddn, destination_filename,
            ae_label, return_event_name, input_dcb, inout_dcb)
char                                    *source_ascii_ddn;
Ft_filename                             source_filename;
char                                    *destination_ascii_ddn;
Ft_filename                             destination_filename;
Ae_label                                *ae_label;
Local_event_name                        return_event_name;
struct Ft_fcopy_in_dcb                  *input_dcb;
struct Ft_fcopy_out_dcb                 **inout_dcb;
```

The ft_fcopy_aet() function copies one FTAM file (contents and attributes) to another FTAM file. The original file remains intact. The new file contains the source file attributes and those attributes that are automatically set (e.g., filesize).

- Both ft_fcopy_aet() and ft_fcopy() can be used for copying files. However, ft_fcopy_aet() sends both the called AE title and calling AE title to the remote system while ft_fcopy() sends only the calling AE title. Also, in ft_fcopy_aet(), the DDN is passed directly as an ASCII string without any conversion while in ft_fcopy(), the DDN must be converted and passed as an Ae_dir_name.
- If the file you are copying to already exists, the outcome depends on how you set input_dcb->overwrite. If input_dcb->overwrite is set to FT_RECREATE_FILE, FTAM copies the source file over the existing destination file. If the value is FT_DONT_RECREATE_FILE, FTAM does not copy the source file over the existing file, the function fails, and you receive an error message.

NOTE

The following points do not apply to HP–UX FTAM responders. HP–UX FTAM responders do not use these fields. The information is provided here because other implementations may use these fields.

- If the file has access control elements, and an identity field matches the source_init_id, the input_dcb->src_concur_cntl must be a subset of the values stored in the conc_access field of struct Ft_access_control_element.

- If the file has access control elements, and an identity field matches the dest_init_id, the input_dcb->dest_concur_cntl must be a subset of the values stored in the conc_access field of struct Ft_access_control_element.
- You must supply matching passwords in input_dcb->source_file_passwords for FT_FA_READ and FT_FA_READ_ATTRIBUTE file actions if the following conditions exist.
  - If the file you are copying from contains an identity (in Ft_access_control_element) that matches the source_init_id AND
  - If passwords exist for these file actions
- You must supply matching passwords in input_dcb->dest_file_passwords if the file you copying to exists and contains an identity (in Ft_access_control_element) that matches the dest_init_id and if passwords exist for these file actions.
  - If the file is an FTAM-1, FTAM-3, or INTAP-1 document type, you must supply matching passwords for FT_FA_DELETE_FILE and FT_FA_REPLACE.
  - If the file is an FTAM–2 document type, you must supply matching passwords for FT_FA_DELETE_FILE and FT_FA_INSERT.

Ft_fcopy_in_dcb

```
struct  Ft_fcopy_in_dcb {
        Ft_initiator_identity           source_init_id;
        Ft_single_file_pw               source_filestore_pw;
        Ft_account                      source_account;
        struct  Ft_file_passwords       source_file_passwords;
        Ft_initiator_identity           dest_init_id;
        Ft_single_file_pw               dest_filestore_pw;
        Ft_account                      dest_account;
        struct  Ft_file_passwords       dest_file_passwords;
        Ft_single_file_pw               create_file_pw;
        enum Ft_delete_overwrite        overwrite;
        struct Ft_concurrency_control   *src_concur_cntl;
        struct Ft_concurrency_control   *dest_concur_cntl;
};
```

Ft_fcopy_out_dcb

```
struct  Ft_fcopy_out_dcb   {
        Uint32                      size;
        struct Api_rc               result;
        enum    Ft_action_result    action_result;
        struct  Ft_attributes       attributes;
        struct  Ft_charging         *charging;
        struct  Ft_diagnostic       *diagnostic;
};
```

ft_fcopy_aet() Parameters

ft_fcopy_aet() Parameter	Type	Description
source_ascii_ddn	Optional Input	Directory distinguished name of the source filestore in ASCII; NULL implies local filestore
source_filename	Mandatory Input	Path name of the file you are copying; must be in the syntax of the real filestore
destination_ascii_ddn	Optional Input	Directory distinguished name of the destination filestore in ASCII; NULL implies local filestore
destination_filename	Optional Input	Path name of the file to which you are copying; NULL implies source_filename; must be in the syntax of the real filestore
ae_label	Mandatory Input	Unique identifier of ftam_init you want to service the request; if pointing to a NULL location, the interface uses a currently activated ftam_init or activates and deactivates a ftam_init
	Output	Unique identifier for ftam_init that serviced the request
return_event_name	Mandatory Input	If the call is asynchronous, uniquely identifies the function call; if the call is synchronous, the value is 0 (zero)
input_dcb-> source_init_id	Optional Input	Source login account

ft_fcopy_aet() Parameter	Type	Description
input_dcb-> source_filestore_pw	Optional Input	Login password for the source_init_id account
input_dcb-> source_account	Optional Input	Identifies who is responsible for accumulated storage charges on source file; HP–UX responders accept, but ignore, this value
input_dcb-> source_file_passwords	Optional Input (Used only with non-HP-UX responders.)	Structure containing the passwords for FT_FA_READ and FT_FA_READ_ATTRIBUTE. Set source_file_passwords only if the file you are copying from has an identity (in Ft_access_control_element) that matches source_init_id and if passwords exist for these two actions
input_dcb- >dest_init_id	Optional Input	Destination login account
input_dcb-> dest_filestore_pw	Optional Input	Login password for the dest_init_id account
input_dcb-> dest_account	Optional Input	Identifies who is responsible for accumulated storage charges on destination file; HP–UX responders accept, but ignore, this value.
input_dcb-> dest_file_passwords	Optional Input (Used only with non-HP-UX responders.)	Structure containing the passwords for the actions FT_FA_DELETE_FILE (FTAM-1, FTAM-2, FTAM-3, INTAP-1),. Set dest_file_passwords only if the file has an identity (in Ft_access_control_element) that matches dest_init_id and if passwords exist for these actions
input_dcb-> create_file_pw	Optional Input	Establishes permission to create files in the destination filestore
input_dcb->overwrite	Optional Input	Determines action taken if the destination file exists

ft_fcopy_aet() Parameter	Type	Description
input_dcb-> src_concur_cntl	Optional Input (Used only with non-HP-UX responders.)	Sets the concurrency control for source_filename; compared to conc_access in struct Ft_access_control_element if an identity field matches the source_init_id
input_dcb-> dest_concur_cntl	Optional Input (Used only with non-HP-UX responders.)	Sets the concurrency control for destination_filename; compared to conc_access in struct Ft_access_control_element if an identity field matches the dest_init_id
inout_dcb->size	Mandatory input if using inout_dcb	Size (in Octets) of the inout_dcb structure and data
inout_dcb->result	Output	Pointer to the struct Api_rc containing the outcome of the operation: result_code (MAP 3.0 error) and vendor_code (HP–UX—specific error)
inout_dcb-> action_result	Output	Specifies the overall success or failure of the request
inout_dcb->attributes	Output	Contains values of the attributes that uniquely identify the destination file
inout_dcb->charging	Output	HP–UX responders do not use charging, though it may contain information from other responders
inout_dcb->diagnostic	Output	Provides ISO-specific error information

ft_fmove_aet()

```
#include %</opt/ftam/include/map.h>
#include %</opt/ftam/include/mapftam.h>
Return_code
ft_fmove_aet(source_ascii_ddn, source_filename,
            destination_ascii_ddn, destination_filename,
            ae_label, return_event_name, input_dcb, inout_dcb)
char                                    *source_dirname;
Ft_filename                             source_filename;
char                                    *destination_dirname;
Ft_filename                             destination_filename;
Ae_label                                *ae_label;
Local_event_name                        return_event_name;
struct Ft_fmove_in_dcb                  *input_dcb;
struct Ft_fmove_out_dcb                 **inout_dcb;
```

The ft_fmove_aet() function moves a file from one filestore to another (i.e., moves source_filename in the source_dirname filestore to destination_filename in the destination_dirname filestore). The new file contains the source file attributes that are automatically set (e.g., filesize).

- Both ft_fmove_aet() and ft_fmove() are used for moving files. However, ft_fmove_aet() sends bot the Called AE Title and calling AE title to the remote system while ft_fmove() sends only the calling AE title. Also, in ft_fmove_aet(), the DDN is passed directly as an ASCII string without conversion while in ft_move(), the DDN has to be converted and passed as an Ae_dir_name.
- If the file you are moving to already exists, the outcome depends on how you set input_dcb->overwrite. If input_dcb->overwrite is set to FT_RECREATE_FILE, FTAM copies the source file over the existing destination file. If the value is FT_DONT_RECREATE_FILE, FTAM does not copy the source file over the existing file, the function fails, and you receive an error.

NOTE

The following points do not apply to HP–UX FTAM responders. HP–UX FTAM responders do not use these fields. The information is provided here because other implementations may use these fields.

- If the file has access control elements, and an identity field matches the source_init_id, the input_dcb->src_concur_cntl must be a subset of the values stored in the conc_access field of struct Ft_access_control_element.

- If the file has access control elements, and an identity field matches the dest_init_id, the input_dcb->dest_concur_cntl must be a subset of the values stored in the conc_access field of struct Ft_access_control_element.
- You must supply matching passwords in input_dcb->source_file_ passwords for FT_FA_READ, FT_FA_READ_ATTRIBUTE, and FT_FA_DELETE_FILE file actions if the following conditions exist.
  - If the file you are moving contains an identity (in Ft_access_control_element) that matches the source_init_id AND
  - If passwords exist for these file actions
- You must supply matching passwords in input_dcb->dest_file_passwords if the file you are moving to exists and contains an identity (in Ft_access_control_element) that matches the dest_init_id and if passwords exist for these file actions.
  - If the file is an FTAM–1, FTAM–3, or INTAP-1 document type, you must supply matching passwords for FT_FA_DELETE_FILE and FT_FA_REPLACE.
  - If the file is an FTAM–2 document type, you must supply matching passwords for FT_FA_DELETE_FILE and FT_FA_INSERT.

Ft_fmove_in_dcb

```
struct  Ft_fmove_in_dcb {
        Ft_initiator_identity           source_init_id;
        Ft_single_file_pw               source_filestore_pw;
        Ft_account                      source_account;
        struct  Ft_file_passwords       source_file_passwords;
        Ft_initiator_identity           dest_init_id;
        Ft_single_file_pw               dest_filestore_pw;
        Ft_account                      dest_account;
        struct  Ft_file_passwords       dest_file_passwords;
        Ft_single_file_pw               create_file_pw;
        enum Ft_delete_overwrite        overwrite;
        struct Ft_concurrency_control   *src_concur_cntl;
        struct Ft_concurrency_control   *dest_concur_cntl;
};
```

Ft_fmove_out_dcb

```
struct  Ft_fmove_out_dcb {
        Uint32                  size;
        struct Api_rc           result;
        enum    Ft_action_result action_result;
        struct  Ft_attributes   attributes;
        struct  Ft_charging     *charging;
        struct  Ft_diagnostic   *diagnostic;
};
```

ft_fmove_aet() Parameters

ft_fmove_aet() Parameter	Type	Description
source_ascii_ddn	Optional Input	Directory distinguished name of the source filestore in ASCII; NULL implies local filestore
source_filename	Mandatory Input	Path name of the file you are moving; must be in the syntax of the real filestore
destination_ascii_ddn	Optional Input	Directory distinguished name of the destination filestore in ASCII; NULL implies local filestore
destination_filename	Optional Input	Path name of the file to which you are moving; NULL implies source_filename; must be in the syntax of the real filestore
ae_label	Mandatory Input	Uniquely identifier of ftam_init you want to service the request; if pointing to a NULL location, the interface uses a currently activated ftam_init or activates and deactivates a ftam_init
	Output	Uniquely identifier for ftam_init that serviced the request
return_event_name	Mandatory Input	If the call is asynchronous, uniquely identifies the function call; if the call is synchronous, the value is 0 (zero)
input_dcb-> source_init_id	Optional Input	Source login account
input_dcb-> source_filestore_pw	Optional Input	Login password for the source_init_id account

ft_fmove_aet() Parameter	Type	Description
input_dcb-> source_account	Optional Input	Identifies who is responsible for accumulated storage charges on source file; HP–UX responders accept, but ignore this value
input_dcb-> source_file_passwords	Optional Input (Used only with non—HP–UX responders.)	Structure containing the passwords for FT_FA_READ, FT_FA_READ_ATTRIBUTE, and FT_FA_DELETE_FILE. Set source_file_passwords only if the file you are moving has an identity (in Ft_access_control_element) that matches source_init_id and if passwords exist for these three actions
input_dcb-> dest_init_id	Optional Input	Destination login account
input_dcb-> dest_filestore_pw	Optional Input	Login password for the dest_init_id account
input_dcb-> dest_account	Optional Input	Identifies who is responsible for accumulated storage charges on destination file; HP–UX responders accept, but ignore, this value
input_dcb-> dest_file_passwords	Optional Input (Used only with non-HP-UX responders.)	Structure containing the passwords for the actions FT_FA_DELETE_FILE (FTAM-1, FTAM-2, FTAM-3, INTAP-1), FT_FA_INSERT (FTAM-2), and FT_FA_REPLACE (FTAM-1, FTAM-3, INTAP-1). Set dest_file_passwords only if the file has an identity (in Ft_access_control_element) that matches dest_init_id, and if passwords exist for these actions
input_dcb-> create_file_pw	Optional Input	Establishes permission to create files in the destination filestore
input_dcb- >overwrite	Optional Input (Used only with non—HP–UX responders.)	Determines action taken if the destination file exists

ft_fmove_aet() Parameter	Type	Description
input_dcb-> src_concur_cntl	Optional Input (Used only with non—HP–UX responders.)	Sets the concurrency control for source_filename; compared to conc_access in struct Ft_access_control_element if an identity field matches the source_init_id
input_dcb-> dest_concur_cntl	Optional Input (Used only with non—HP–UX responders.)	Sets the concurrency control for destination_filename; compared to conc_access in struct Ft_access_control_element if an identity field matches the dest_init_id
inout_dcb->size	Mandatory input if using inout_dcb	Size (in Octets) of the inout_dcb structure and data
inout_dcb->result	Output	Pointer to the struct Api_rc containing the outcome of the operation: result_code (MAP 3.0 error) and vendor_code (HP–UX—specific error)
inout_dcb-> action_result	Output	Specifies the overall success or failure of the request
inout_dcb- >attributes	Output	Contains values of the attributes that uniquely identify the destination file
inout_dcb->charging	Output	HP–UX responders do not use charging, though it may contain information from other responders
inout_dcb- >diagnostic	Output	Provides ISO-specific error information

Reading and Changing Attributes (HLCF)

Use ft_frattributes() and ft_frattributes_aet to read file attributes, and ft_fcattributes() and ft_fcattributes_aet() to change file attributes by making only one call.

ft_frattributes()

```
#include %</opt/ftam/include/map.h>
#include %</opt/ftam/include/mapftam.h>
Return_code
ft_frattributes (dirname, filename, ae_label,
                 return_event_name, input_dcb, inout_dcb)
Ae_dir_name                              dirname;
Ft_filename                              filename;
Ae_label                                 *ae_label;
Local_event_name                         return_event_name;
struct Ft_frattributes_in_dcb            *input_dcb;
struct Ft_frattributes_out_dcb           **inout_dcb;
```

Use ft_frattributes() to read file attributes. Examples of using ft_frattributes() are as follows.

You might want to use ft_frattributes() to determine the creation dates when a deleting files older than a specific date. Another example of using ft_frattributes() is to know how to set destination file attributes when copying files with low level calls.

- If the responder supports the conc_access field of struct Ft_access_control_element, and the file has access control elements, and an identity field matches the init_id, the input_dcb->concurrency_control must be a subset of the values stored in the conc_access. HP-UX responders do not support the conc_access field of struct Ft_access_control_element.
- The input_dcb->attribute_names field defaults to indicate all attributes in the attribute_groups negotiated.

- You must supply matching passwords in input_dcb->file_passwords for FT_FA_READ and FT_FA_READ_ATTRIBUTE file actions if the following conditions exist.
  - If the file contains an identity (in Ft_access_control_element) that matches the init_id AND
  - If passwords exist for these file actions
- HP–UX responders set storage_account, future_filesize, legal_qualifications, and private_use so that the indication no value available (0) returns when you invoke ft_frattributes().

Ft_frattributes_in_dcb

```
struct  Ft_frattributes_in_dcb {
        Ft_initiator_identity           init_id;
        Ft_single_file_pw               filestore_pw;
        struct  Ft_file_passwords       file_passwords;
        Ft_attribute_names              attribute_names;
        Ft_account                      account;
        struct Ft_concurrency_control   *concurrency_control;
};
```

Ft_frattributes_out_dcb

```
struct  Ft_frattributes_out_dcb       {
        Uint32                      size;
        struct Api_rc               result;
        enum    Ft_action_result    action_result;
        struct  Ft_attributes       attributes;
        struct  Ft_charging         *charging;
        struct  Ft_diagnostic       *diagnostic;
};
```

ft_frattributes() Parameters

ft_frattributes() Parameter	Type	Description
dirname	Optional Input	Directory distinguished name of the filestore; NULL implies the local filestore
filename	Mandatory Input	Path name of the file that has the attributes you are reading; must be in the syntax of the real filestore
ae_label	Mandatory Input	Unique identifier for ftam_init you want to service the request; if pointing to a NULL location, the interface uses a currently activated ftam_init or activates and deactivates a ftam_init
	Output	Unique identifier for ftam_init that serviced the request
return_event_name	Mandatory Input	If the call is asynchronous, uniquely identifies the function call; if the call is synchronous, the value is 0 (zero)
input_dcb->init_id	Optional Input	Login account
input_dcb-> filestore_pw	Optional Input	Login password for init_id
input_dcb-> file_passwords	Optional Input	Structure containing the passwords for FT_FA_READ and FT_FA_READ_ATTRIBUTE. Set file_passwords only if the file has an identity (in Ft_access_control_element) that matches init_id and if passwords exist for these two actions
input_dcb-> attribute_names	Optional Input	Mask that indicates which file attributes to read
input_dcb->account	Optional Input	Identifies who is responsible for accumulated file storage charges; HP–UX responders accept, but ignore, this value

ft_frattributes() Parameter	Type	Description
input_dcb-> concurrency_control	Optional input (Used only with non—HP–UX responders.)	Sets the concurrency control for filename; compared to conc_access in struct Ft_access_control_element if an identity field matches the init_id
inout_dcb->size	Mandatory input if using inout_dcb	Size (in Octets) of the inout_dcb structure and data
inout_dcb->result	Output	Pointer to the struct Api_rc containing the outcome of the operation: result_code (MAP 3.0 error) and vendor_code (HP–UX—specific error)
inout_dcb-> action_result	Output	Specifies the overall success or failure of the request
inout_dcb- >attributes	Output	Contains values of the attributes of the file you read
inout_dcb- >charging	Output	HP–UX responders do not use charging, though it may contain information from other responders
inout_dcb-> diagnostic	Output	Provides ISO-specific error information

ft_fcattributes()

```
#include %</opt/ftam/include/map.h>
#include %</opt/ftam/include/mapftam.h>
Return_code
ft_fcattributes (dirname, filename, ae_label,
                 return_event_name, input_dcb, inout_dcb)
Ae_dir_name                              dirname;
Ft_filename                              filename;
Ae_label                                 *ae_label;
Local_event_name                         return_event_name;
struct Ft_fcattributes_in_dcb            *input_dcb;
struct Ft_fcattributes_out_dcb           **inout_dcb;
```

Use ft_fcattributes() to change file attributes. For example, you can change an attribute such as access_control to place file access restrictions on a specific user.

- The attribute_groups negotiated dictate the attributes you can change.

Attributes You Can Change	Attributes You Cannot Change
access_control	contents_type
file_availability	date_time_of_attribute_mod
filename	date_time_of_creation
future_filesize*	date_time_of_modification
legal_qualification*	date_time_of_read filesize
private_use*	identity_of_attribute_mod
storage_account*	identity_of_creator
	identity_of_modifier
	identity_of_reader
	permitted_actions

* HP–UX responders accept, but ignore, these values.

- If the responder supports the conc_access field of struct Ft_access_control_element, and the file has access control elements, and an identity field matches the init_id, the input_dcb->concurrency_control must be a subset of the values stored in the conc_access. HP-UX responders do not support the conc_access field of struct Ft_access_control_element.

- You must supply matching passwords in input_dcb->file_passwords for FT_FA_READ and FT_FA_CHANGE_ATTRIBUTE file actions if the following conditions exist.
  - If the file contains an identity (in Ft_access_control_element) that matches the init_id AND
  - If passwords exist for these file actions

Ft_fcattributes_in_dcb

```
struct  Ft_fcattributes_in_dcb {
        Ft_initiator_identity           init_id;
        Ft_single_file_pw               filestore_pw;
        struct  Ft_file_passwords       file_passwords;
        Ft_attribute_names              attribute_names;
        struct  Ft_attributes           attributes;
        Ft_account                      account;
        struct Ft_concurrency_control   *concurrency_control;
};
```

Ft_fcattributes_out_dcb

```
struct  Ft_fcattributes_out_dcb {
        Uint32                      size;
        struct Api_rc               result;
        enum    Ft_action_result    action_result;
        struct  Ft_attributes       attributes;
        struct  Ft_charging         *charging;
        struct  Ft_diagnostic       *diagnostic;
};
```

ft_fcattributes() Parameters

ft_fcattributes() Parameter	Type	Description
dirname	Optional Input	Directory distinguished name of the filestore; NULL implies the local filestore
filename	Mandatory Input	Path name of the file that has the attributes you are changing; must be in the syntax of the real filestore
ae_label	Mandatory Input	Unique identifier for ftam_init you want to service the request; if pointing to a NULL location, the interface uses a currently activated ftam_init or activates and deactivates a ftam_init

ft_fcattributes() Parameter	Type	Description
	Output	Unique identifies the ftam_init that serviced the request
return_event_name	Mandatory Input	If the call is asynchronous, uniquely identifies the function call; if the call is synchronous, the value is 0 (zero)
input_dcb-> attribute_names	Mandatory Input	Mask that indicates which file attributes to change
input_dcb-> attributes.values	Mandatory Input	Contains values you want to change for the attributes given in attribute_names
input_dcb->init_id	Optional Input	Login account
input_dcb-> filestore_pw	Optional Input	Login password for init_id
input_dcb->account	Optional input	Identifies who is responsible for accumulated file storage charges; HP–UX responders accept, but ignore, this value
input_dcb-> concurrency_control	Optional input Used only when using access control	Sets the concurrency control for filename; compared to conc_access in struct Ft_access_control_element if an identity field matches the init_id
inout_dcb->size	Mandatory input if using inout_dcb	Size (in Octets) of the inout_dcb structure and data
inout_dcb->result	Output	Pointer to the struct Api_rc containing the outcome of the operation: result_code (MAP 3.0 error) and vendor_code (HP–UX—specific error)
inout_dcb-> action_result	Output	Specifies the overall success or failure of the request
inout_dcb-> attributes	Output	Contains values of the attributes that changed; access_passwords do not return

ft_fcattributes() Parameter	Type	Description
inout_dcb-> charging	Output	HP–UX responders do not use charging, though it may contain information from other responders
inout_dcb-> diagnostic	Output	Provides ISO-specific error information
input_dcb-> file_passwords	Optional Input	Structure containing the passwords for FT_FA_READ and FT_FA_CHANGE_ATTRIBUTE. Set file_passwords only if the file has an identity (in Ft_access_control_element) that matches init_id and if passwords exist for these two actions

ft_frattributes_aet()

```
#include %</opt/ftam/include/map.h>
#include %</opt/ftam/include/mapftam.h>
Return_code
ft_frattributes_aet (ascii_ddn, filename, ae_label,
                return_event_name, input_dcb, inout_dcb)
char                                    *ascii_ddn;
Ft_filename                             filename;
Ae_label                                *ae_label;
Local_event_name                        return_event_name;
struct Ft_frattributes_in_dcb           *input_dcb;
struct Ft_frattributes_out_dcb          **inout_dcb;
```

Use ft_frattributes_aet() to read file attributes. Examples of using ft_frattributes_aet() are as follows.

You might want to use ft_frattributes_aet() to determine the creation dates when a deleting files older than a specific date. Another example of using ft_frattributes_aet() is to know how to set destination file attributes when copying files with low level calls.

- Both ft_frattributes_aet() and ft_frattributes() are used for reading file attributes. However, ft_frattributes_aet() sends both the Called AE Title and calling AE title to the remote system while ft_frattributes() sends only the calling AE title. Also, in ft_frattributes_aet(), the DDN is passed directly as an ASCII string without any conversion while in ft_frattributes(), the DDN has to be converted and passed as an Ae_dir_name.
- If the responder supports the conc_access field of struct Ft_access_control_element, and the file has access control elements, and an identity field matches the init_id, the input_dcb->concurrency_control must be a subset of the values stored in the conc_access. HP-UX responders do not support the conc_access field of struct Ft_access_control_element.
- The input_dcb->attribute_names field defaults to indicate all attributes in the attribute_groups negotiated.
- You must supply matching passwords in input_dcb->file_passwords for FT_FA_READ and FT_FA_READ_ATTRIBUTE file actions if the following conditions exist.
  - If the file contains an identity (in Ft_access_control_element) that matches the init_id AND
  - If passwords exist for these file actions

- HP–UX responders set storage_account, future_filesize, legal_qualifications, and private_use so that the indication no value available (0) returns when you invoke ft_frattributes_aet().

Ft_frattributes_in_dcb

```
struct  Ft_frattributes_in_dcb {
        Ft_initiator_identity           init_id;
        Ft_single_file_pw               filestore_pw;
        struct  Ft_file_passwords       file_passwords;
        Ft_attribute_names              attribute_names;
        Ft_account                      account;
        struct Ft_concurrency_control   *concurrency_control;
};
```

Ft_frattributes_out_dcb

```
struct  Ft_frattributes_out_dcb       {
        Uint32                      size;
        struct Api_rc               result;
        enum    Ft_action_result    action_result;
        struct  Ft_attributes       attributes;
        struct  Ft_charging         *charging;
        struct  Ft_diagnostic       *diagnostic;
};
```

ft_frattributes_aet() Parameters

ft_frattributes_aet() Parameter	Type	Description
ascii_ddn	Optional Input	Directory distinguished name of the filestore in ASCII; NULL implies the local filestore
filename	Mandatory Input	Path name of the file that has the attributes you are reading; must be in the syntax of the real filestore
ae_label	Mandatory Input	Unique identifier for ftam_init you want to service the request; if pointing to a NULL location, the interface uses a currently activated ftam_init or activates and deactivates a ftam_init
	Output	Unique identifier for ftam_init that serviced the request

ft_frattributes_aet() Parameter	Type	Description
return_event_name	Mandatory Input	If the call is asynchronous, uniquely identifies the function call; if the call is synchronous, the value is 0 (zero)
input_dcb->init_id	Optional Input	Login account
input_dcb-> filestore_pw	Optional Input	Login password for init_id
input_dcb-> file_passwords	Optional Input	Structure containing the passwords for FT_FA_READ and FT_FA_READ_ATTRIBUTE. Set file_passwords only if the file has an identity (in Ft_access_control_element) that matches init_id and if passwords exist for these two actions
input_dcb-> attribute_names	Optional Input	Mask that indicates which file attributes to read
input_dcb->account	Optional Input	Identifies who is responsible for accumulated file storage charges; HP–UX responders accept, but ignore, this value
input_dcb-> concurrency_control	Optional input (Used only with non—HP–UX responders.)	Sets the concurrency control for filename; compared to conc_access in struct Ft_access_control_element if an identity field matches the init_id
inout_dcb->size	Mandatory input if using inout_dcb	Size (in Octets) of the inout_dcb structure and data
inout_dcb->result	Output	Pointer to the struct Api_rc containing the outcome of the operation: result_code (MAP 3.0 error) and vendor_code (HP–UX—specific error)
inout_dcb-> action_result	Output	Specifies the overall success or failure of the request

ft_frattributes_aet() Parameter	Type	Description
inout_dcb->attributes	Output	Contains values of the attributes of the file you read
inout_dcb->charging	Output	HP–UX responders do not use charging, though it may contain information from other responders
inout_dcb->diagnostic	Output	Provides ISO-specific error information

ft_fcattributes_aet()

```
#include %</opt/ftam/include/map.h>
#include %</opt/ftam/include/mapftam.h>
Return_code
ft_fcattributes_aet (ascii_ddn, filename, ae_label,
                return_event_name, input_dcb, inout_dcb)
char                                    *ascii_ddn;
Ft_filename                             filename;
Ae_label                                *ae_label;
Local_event_name                        return_event_name;
struct Ft_fcattributes_in_dcb           *input_dcb;
struct Ft_fcattributes_out_dcb          **inout_dcb;
```

Use ft_fcattributes_aet() to change file attributes. For example, you can change an attribute such as access_control to place file access restrictions on a specific user.

- Both ft_fcattributes_aet() and ft_fcattributes() are used for changing file attributes. However, ft_fcattributes_aet() sends both the Called AE Title and calling AE title to the remote system while ft_fcattributes() sends only the calling AE title. Also, in ft_fcattributes_aet(), the DDN is passed directly as an ASCII string without any conversion while in ft_fcattributes(), the DDN has to be converted and passed as an Ae_dir_name.
- The attribute_groups negotiated dictate the attributes you can change.

Attributes You Can Change	Attributes You Cannot Change
access_control	contents_type
file_availability	date_time_of_attribute_mod
filename	date_time_of_creation
future_filesize*	date_time_of_modification
legal_qualification*	date_time_of_read
private_use*	filesize
storage_account*	identity_of_attribute_mod
	identity_of_creator
	identity_of_modifier
	identity_of_reader
	permitted_actions

* HP–UX responders accept, but ignore, these values.

- If the responder supports the conc_access field of struct Ft_access_control_element, and the file has access control elements, and an identity field matches the init_id, the input_dcb->concurrency_control must be a subset of the values stored in the conc_access. HP-UX responders do not support the conc_access field of struct Ft_access_control_element.
- You must supply matching passwords in input_dcb->file_passwords for FT_FA_READ and FT_FA_CHANGE_ATTRIBUTE file actions if the following conditions exist.
  - If the file contains an identity (in Ft_access_control_element) that matches the init_id AND
  - If passwords exist for these file actions

Ft_fcattributes_in_dcb

```
struct  Ft_fcattributes_in_dcb {
        Ft_initiator_identity           init_id;
        Ft_single_file_pw               filestore_pw;
        struct  Ft_file_passwords       file_passwords;
        Ft_attribute_names              attribute_names;
        struct  Ft_attributes           attributes;
        Ft_account                      account;
        struct Ft_concurrency_control   *concurrency_control;
};
```

Ft_fcattributes_out_dcb

```
struct  Ft_fcattributes_out_dcb {
        Uint32                      size;
        struct Api_rc               result;
        enum    Ft_action_result    action_result;
        struct  Ft_attributes       attributes;
        struct  Ft_charging         *charging;
        struct  Ft_diagnostic       *diagnostic;
};
```

ft_fcattributes_aet() Parameters

ft_fcattributes_aet () Parameter	Type	Description
ascii_ddn	Optional Input	Directory distinguished name of the filestore in ASCII; NULL implies the local filestore
filename	Mandatory Input	Path name of the file that has the attributes you are changing; must be in the syntax of the real filestore
ae_label	Mandatory Input	Uniquely identifier for ftam_init you want to service the request; if pointing to a NULL location, the interface uses a currently activated ftam_init or activates and deactivates a ftam_init
	Output	Uniquely identifies the ftam_init that serviced the request
return_event_name	Mandatory Input	If the call is asynchronous, uniquely identifies the function call; if the call is synchronous, the value is 0 (zero)
input_dcb-> attribute_names	Mandatory Input	Mask that indicates which file attributes to change
input_dcb-> attributes.values	Mandatory Input	Contains values you want to change for the attributes given in attribute_names
input_dcb->init_id	Optional Input	Login account
input_dcb-> filestore_pw	Optional Input	Login password for init_id
input_dcb->account	Optional input	Identifies who is responsible for accumulated file storage charges; HP–UX responders accept, but ignore, this value
input_dcb-> concurrency_control	Optional input (Used only when using access control)	Sets the concurrency control for filename; compared to conc_access in struct Ft_access_control_element if an identity field matches the init_id

ft_fcattributes_aet () Parameter	Type	Description
inout_dcb->size	Mandatory input if using inout_dcb	Size (in Octets) of the inout_dcb structure and data
inout_dcb->result	Output	Pointer to the struct Api_rc containing the outcome of the operation: result_code (MAP 3.0 error) and vendor_code (HP–UX—specific error)
inout_dcb-> action_result	Output	Specifies the overall success or failure of the request
inout_dcb-> attributes	Output	Contains values of the attributes that changed; access_passwords do not return
inout_dcb-> charging	Output	HP–UX responders do not use charging, though it may contain information from other responders
inout_dcb-> diagnostic	Output	Provides ISO-specific error information
input_dcb-> file_passwords	Optional Input	Structure containing the passwords for FT_FA_READ and FT_FA_CHANGE_ATTRIBUTE. Set file_passwords only if the file has an identity (in Ft_access_control_element) that matches init_id and if passwords exist for these two actions

Deleting Files (HLCF)

To delete files, invoke ft_fdelete() or ft_delete_aet().

ft_fdelete()

```
#include %</opt/ftam/include/map.h>
#include %</opt/ftam/include/mapftam.h>
Return_code
ft_fdelete (dirname, filename, ae_label, return_event_name,
            input_dcb, inout_dcb)
Ae_dir_name                             dirname;
Ft_filename                             filename;
Ae_label                                *ae_label;
Local_event_name                        return_event_name;
struct Ft_fdelete_in_dcb                *input_dcb;
struct Ft_fdelete_out_dcb               **inout_dcb;
```

The ft_fdelete() function deletes files from the filestore. Once you delete the file, you cannot recover it.

If the responder supports the conc_access field of struct Ft_access_control_element, and the file has access control elements, and an identity field matches the init_id, the input_dcb->concurrency_control must be a subset of the values stored in the conc_access. HP-UX responders do not support the conc_access field of struct Ft_access_control_element.

Ft_fdelete_in_dcb

```
struct  Ft_fdelete_in_dcb {
        Ft_initiator_identity           init_id;
        Ft_single_file_pw               filestore_pw;
        Ft_single_file_pw               delete_file_pw;
        Ft_account                      account;
        struct Ft_concurrency_control   *concurrency_control;
};
```

Ft_fdelete_out_dcb

```
struct  Ft_fdelete_out_dcb {
        Uint32                      size;
        struct Api_rc               result;
        enum    Ft_action_result    action_result;
        struct  Ft_charging         *charging;
        struct  Ft_diagnostic       *diagnostic;
};
```

ft_fdelete() Parameters

ft_fdelete() Parameter	Type	Description
dirname	Optional Input	Directory distinguished name of the filestore; NULL implies the local filestore
filename	Mandatory Input	Path name of the file you are deleting; must be in the syntax of the real filestore
ae_label	Mandatory Input	Unique identifier for ftam_init you want to service the request; if pointing to a NULL location, the interface uses a currently activated ftam_init or activates and deactivates a ftam_init
	Output	Unique identifier for ftam_init that serviced the request
return_event_name	Mandatory Input	If the call is asynchronous, uniquely identifies the function call; if the call is synchronous, the value is 0 (zero)
input_dcb->init_id	Optional Input	Login account
input_dcb->filestore_pw	Optional Input	Login password for init_id
input_dcb->delete_file_pw	Optional Input	Establishes permission to delete files from the filestore; HP–UX responders accept, but ignore, this value
input_dcb->account	Optional Input	Identifies who is responsible for accumulated file storage charges; HP–UX responders accept, but ignore, this value
input_dcb->concurrency_control	Optional input (Used only with non—HP–UX responders.)	Sets the concurrency control for filename; compared to conc_access in struct Ft_access_control_element if an identity field matches the init_id

ft_fdelete() Parameter	Type	Description
inout_dcb->size	Mandatory input if using inout_dcb	Size (in Octets) of the inout_dcb structure and data
inout_dcb->result	Output	Pointer to the struct Api_rc containing the outcome of the operation: result_code (MAP 3.0 error) and vendor_code (HP–UX—specific error)
inout_dcb-> action_result	Output	Specifies the overall success or failure of the request
inout_dcb- >charging	Output	HP–UX responders do not use charging, though it may contain information from other responders
inout_dcb-> diagnostic	Output	Provides ISO-specific error information

ft_fdelete_aet()

```
#include %</opt/ftam/include/map.h>
#include %</opt/ftam/include/mapftam.h>
Return_code
ft_fdelete_aet (ascii_ddn, filename, ae_label,
            return_event_name, input_dcb, inout_dcb)
char                                    *ascii_ddn;
Ft_filename                             filename;
Ae_label                                *ae_label;
Local_event_name                        return_event_name;
struct Ft_fdelete_in_dcb                *input_dcb;
struct Ft_fdelete_out_dcb               **inout_dcb;
```

The ft_fdelete_aet() function deletes files from the filestore. Once you delete the file, you cannot recover it.

If the responder supports the conc_access field of struct Ft_access_control_element, and the file has access control elements, and an identity field matches the init_id, the input_dcb->concurrency_control must be a subset of the values stored in the conc_access. HP-UX responders do not support the conc_access field of struct Ft_access_control_element.

Both ft_fdelete_aet() and ft_fdelete() are used for deleting files. However, ft_fdelete_aet() sends both the Called AE Title and calling AE title to the remote system while ft_fdelete() sends only the calling AE title. Also, in ft_fdelete_aet(), the DDN is passed directly as an ASCII string without any conversion while in ft_fdelete(), the DDN has to be converted and passed as an Ae_dir_name.

Ft_fdelete_in_dcb

```
struct  Ft_fdelete_in_dcb {
        Ft_initiator_identity           init_id;
        Ft_single_file_pw               filestore_pw;
        Ft_single_file_pw               delete_file_pw;
        Ft_account                      account;
        struct Ft_concurrency_control   *concurrency_control;
};
```

Ft_fdelete_out_dcb

```
struct  Ft_fdelete_out_dcb {
        Uint32                      size;
        struct Api_rc               result;
        enum    Ft_action_result    action_result;
        struct  Ft_charging         *charging;
        struct  Ft_diagnostic       *diagnostic;
};
```

ft_fdelete_aet() Parameters

ft_fdelete_aet() Parameter	Type	Description
ascii_ddn	Optional Input	Directory distinguished name of the filestore in ASCII; NULL implies the local filestore
filename	Mandatory Input	Path name of the file you are deleting; must be in the syntax of the real filestore
ae_label	Mandatory Input	Unique identifier for ftam_init you want to service the request; if pointing to a NULL location, the interface uses a currently activated ftam_init or activates and deactivates a ftam_init
	Output	Unique identifier for ftam_init that serviced the request
return_event_name	Mandatory Input	If the call is asynchronous, uniquely identifies the function call; if the call is synchronous, the value is 0 (zero)
input_dcb->init_id	Optional Input	Login account
input_dcb->filestore_pw	Optional Input	Login password for init_id
input_dcb->delete_file_pw	Optional Input	Establishes permission to delete files from the filestore; HP–UX responders accept, but ignore, this value
input_dcb->account	Optional Input	Identifies who is responsible for accumulated file storage charges; HP–UX responders accept, but ignore, this value
input_dcb->concurrency_control	Optional input (Used only with non—HP–UX responders.)	Sets the concurrency control for source_filename; compared to conc_access in struct Ft_access_control_element if an identity field matches the source_init_id

ft_fdelete_aet() Parameter	Type	Description
inout_dcb->size	Mandatory input if using inout_dcb	Size (in Octets) of the inout_dcb structure and data
inout_dcb->result	Output	Pointer to the struct Api_rc containing the outcome of the operation: result_code (MAP 3.0 error) and vendor_code (HP–UX—specific error)
inout_dcb-> action_result	Output	Specifies the overall success or failure of the request
inout_dcb- >charging	Output	HP–UX responders do not use charging, though it may contain information from other responders
inout_dcb-> diagnostic	Output	Provides ISO-specific error information

6 Managing HP FTAM/9000 Connections

To use context sensitive FTAM operations, you must first activate an application entity (AE) and then establish a connection. The AE that you activate is an FTAM initiator (ftam_init). Use connection management functions to control activations and connections. Refer to the “Example Programs” chapter for model programs using the connection management functions.

Chapter Overview

This chapter describes the following functions in the order listed.

Task to Perform	Function Used to Perform the Task	Description
Starting and Stopping Application Entities	ft_aeactivation()	Activate ftam_init
	ft_aedeactivation()	Deactivate ftam_init
Establishing and Removing Connections	ft_connect()	Establish connection from ftam_init to the responder
	ft_rrequest()	Release connection from the responder
	ft_aereset()	Abort all active connections for a ftam_init, and then reset ftam_init
Aborting Connection Requests	ft_abort()	Abort one connection at any time
	ft_ireceive()	Determine who aborted the call and receive abort indication information

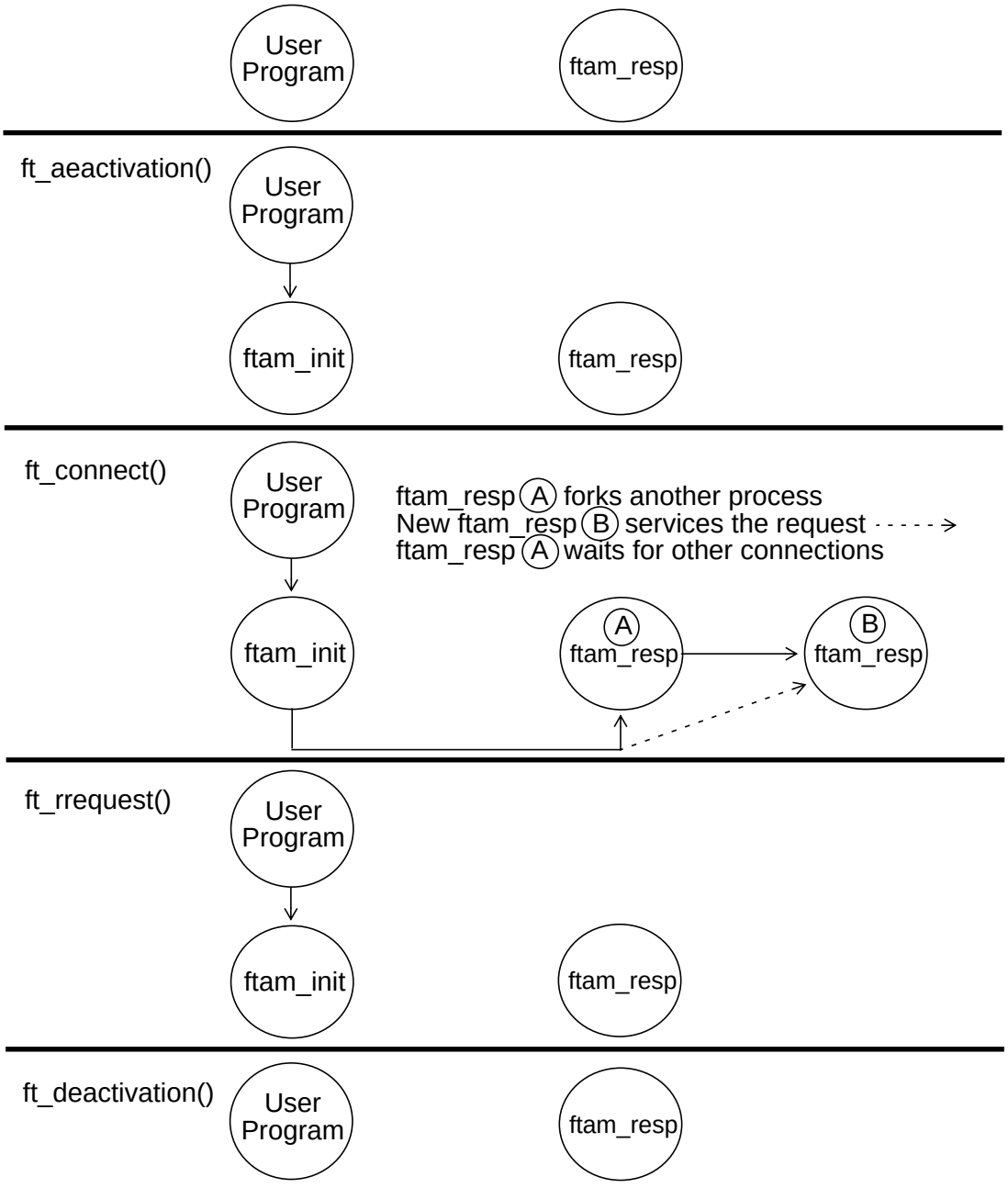
Connection Establishment Process

A typical connection establish and release routine (algorithm) is as follows. You do not have an option regarding the sequence of these events, with the exception of step 4. (Refer to Figure 6-1.)

1. Activate ftam_init (using ft_aeactivation()).
2. Establish the connection (using ft_connect()) between ftam_init and the responder. Note that during the life of the ftam_init, you can establish and release connections arbitrarily.
3. Use FTAM operations as needed.
4. Release the connection (using ft_rrequest()). Alternatively, you can use one of the following functions:
   - ft_aereset() to release all active connections for that ftam_init.
   - ft_abort() used at any time aborts a connection.
5. Deactivate ftam_init (using ft_aedeactivation()).

NOTE This chapter does not explain the parameter structures. For detailed structure information (parameter settings), refer to the “FTAM Data Structures” chapter.

Figure 6-1 Connection Establishment Process



Starting and Stopping Application Entities

Use ft_aeactivation() and ft_aedeactivation() to respectively start and stop ftam_init.

ft_aeactivation()

```
#include %</opt/ftam/include/map.h>
#include %</opt/ftam/include/mapftam.h>
Return_code
ft_aeactivation(my_dir_name, return_event_name, input_dcb,
                inout_dcb, ae_label)
Ae_dir_name                    my_dir_name;
Local_event_name               return_event_name;
struct Ft_aeactivate_in_dcb    *input_dcb;
struct Ft_output               **inout_dcb;
Ae_label                       *ae_label;
```

You must invoke ft_aeactivation() before establishing a connection. By passing my_dir_name (the local ftam_init directory distinguished name) as input, the interface returns the ae_label of the activated ftam_init. Note, directory distinguished names are in the Initial Configuration Store (ICS); they are defined during system configuration and when nodes are added to the network.

Using my_dir_name requires that you set up Ae_dir_dn. You can do so manually (as explained in the “FTAM Data Structures” chapter) or you can call the convert_ddn utility. This utility eases the setting of Ae_dir_dn by automatically setting it and its sub-structures for you. The source for convert_ddn is in /opt/ftam/demos/cnvrt_addr.c. (For instructions, read the on-line README document in this directory.) The “Example Programs” chapter also contains the source for convert_ddn.

Ft_aeactivation_in_dcb

```
struct  Ft_aeactivate_in_dcb {
        struct  Octet_string        authentication;
        enum  Ae_title_option       my_ae_title_option;
        Ae_title                    *my_ae_title;
};
```

Ft_output

```
struct  Ft_output {
        Uint32                  size;
        struct  Api_rc          result;
};
```

ft_aeactivation() Parameters

ft_aeactivation() Parameter	Type	Description
my_dir_name	Mandatory Input	Directory distinguished name identifying the AE (ftam_init) you want to activate
return_event_name	Mandatory Input	If the call is asynchronous, uniquely identifies the function call; if the call is synchronous, the value is 0 (zero)
input_dcb-> authentication	Optional Input	ftam_init accepts, but ignores, this value
input_dcb-> my_ae_title_option	Optional Input	Dictates the interpretation of my_ae_title If it indicates Dir_dist_name_option, my_dir_name must be usable as an address for the local ftam_init Default is No_value_option
input_dcb-> my_ae_title	Optional Input	Optional ae_title sent to the peer AE, which can be either a directory distinguished name or an object_id; determined by how you set my_ae_title_option
inout_dcb->size	Mandatory input if using inout_dcb	Size (in Octets) of the inout_dcb structure and data
inout_dcb->result	Output	Pointer to the struct Api_rc containing the outcome of the operation: result_code and vendor_code (HP-UX—specific error)
ae_label	Output	Uniquely identifies the AE (ftam_init) that serviced the request

ft_aedeactivation()

```
#include %</opt/ftam/include/map.h>
#include %</opt/ftam/include/mapftam.h>
Return_code
ft_aedeactivation(ae_label, return_event_name, inout_dcb)
Ae_label                        *ae_label;
Local_event_name                return_event_name;
struct Ft_output                **inout_dcb;
```

Use ft_aedeactivation() to deactivate the AE (ftam_init) servicing the request.

Ft_output

```
struct  Ft_output {
        Uint32                  size;
        struct  Api_rc          result;
};
```

ft_aedeactivation() Parameters

ft_aedeactivation() Parameter	Type	Description
ae_label	Mandatory Input	Uniquely identifies the AE (ftam_init) you want to deactivate
return_event_name	Mandatory Input	If the call is asynchronous, uniquely identifies the function call; if the call is synchronous, the value is 0 (zero)
inout_dcb->size	Mandatory input if using inout_dcb	Size (in Octets) of the inout_dcb structure and data
inout_dcb->result	Output	Pointer to the struct Api_rc containing the outcome of the operation: result_code and vendor_code (HP-UX—specific error)

Establishing and Removing Connections

Use the ft_connect(), ft_rrequest(), and ft_aereset() functions to connect, release connections, and reset connections in an orderly manner.

ft_connect()

```
#include %</opt/ftam/include/map.h>
#include %</opt/ftam/include/mapftam.h>
Return_code
ft_connect(ae_label, return_event_name, called_dir_name,
           input_dcb, inout_dcb, connection_id)
Ae_label                        ae_label;
Local_event_name                return_event_name;
Ae_dir_name                     called_dir_name;
struct Ft_connect_in_dcb        *input_dcb;
struct Ft_connect_out_dcb       **inout_dcb;
Connection_id                   *connection_id;
```

Use ft_connect() to establish a connection from ftam_init to an FTAM responder. Remember, you must first invoke ft_aeactivation() to start ftam_init.

You will use the returned connection_id on all subsequent, context sensitive FTAM calls to uniquely identify the connection to the desired filestore.

- When invoking ft_connect(), the document types, functional_units, and service_classes are negotiated with the responder. When the request is complete, check these fields in the inout_dcb to see if the responder accepted these values, accepted a subset of these values, or rejected these values.
- You must set either the input_dcb->called_presentation_address or the called_dir_name. If you set both fields, input_dcb->called_presentation_address takes precedence. Refer to the “FTAM Data Structures” chapter to set either of these parameters.

  Specifying these fields requires that you set up the appropriate structures. You can do so manually (as explained in the “FTAM Data Structures” chapter) or you can call one of the following utilities.
- To have the system set the P_address, call convert_paddr; the source is in /opt/ftam/demos/cnvrt_addr.c.

- To have the system set the Ae_dir_name, call convert_ddn; the source is in /opt/ftam/demos/cnvrt_addr.c.

For instructions on using these utilities, read the on-line README document in /opt/ftam/demos/cnvrt_addr.c. The “Example Programs” chapter also contains the source for convert_paddr and convert_ddn.

- For HP-UX responders, the login name (connect_in_info.initiator_identity) must exist on the remote node, and the file_store_pw must be that user's password. Other responders may or may not have similar expectations.
- The inout_dcb structure contains the responder's reply to the requested connection parameters.

Ft_connect_in_dcb

```
struct Ft_connect_in_dcb {
       struct  P_address             called_presentation_address;
       enum    Ae_title_option       called_ae_title_option;
       Ae_title                      *called_ae_title;
       Uint32                        called_ae_invoke_id;
       Uint32                        called_ap_invoke_id;
       Uint8                         number_of_retry;
       Uint32                        delay_between_retry;
       Uint32                        connection_resource_wait_timer;
       struct  Object_id             context_name;
       struct  Ft_connect_req_info   connect_in_info;
};
struct  Ft_connect_req_info  {
     Ft_service_class                  service_class;
     Ft_functional_units               functional_units;
     Ft_attribute_groups               attribute_groups;
     enum  Ft_qos                      quality_of_service;
     struct  Ft_contents_type_element  *contents_type_list;
     Ft_initiator_identity             initiator_identity;
     Ft_account                        account;
     Ft_single_file_pw                 file_store_pw;
};
```

Ft_connect_out_dcb

```
struct  Ft_connect_out_dcb {
        Uint32                          size;
        struct Api_rc                   result;
        struct P_address
responding_presentation_address;
        Ae                              responding_ae;
        Uint32                          responding_ae_invoke_id;
        Uint32                          responding_ap_invoke_id;
        struct Object_id                context_name;
        struct Ft_connect_cnf_info      *connect_out_info;
};


struct Ft_connect_cnf_info {
       enum  Ft_state_result                state_result;
       enum  Ft_action_result               action_result;
       Ft_service_class                     service_class;
       Ft_functional_units                  functional_units;
       Ft_attribute_groups                  attribute_groups;
       enum  Ft_qos                         quality_of_service;
       struct Ft_contents_type_element      contents_type_list;
       struct Ft_diagnostic                 *diagnostic;
       enum  Ft_acse_result                 acse_result;
       struct Ft_acse_diagnostic            acse_diag;
};
```

ft_connect() Parameters

ft_connect() Parameter	Type	Description
ae_label	Mandatory Input	Uniquely identifies the AE (ftam_init) you want to service the request
return_event_name	Mandatory Input	If the call is asynchronous, uniquely identifies the function call; if the call is synchronous, the value is 0 (zero)
called_dir_name	Mandatory Input if no called_ presentation_addr ess given; otherwise, Optional Input	Directory distinguished name identifying the responder to which you want to connect

ft_connect() Parameter	Type	Description
input_dcb->called_ presentation_address	Mandatory Input if no called_dir_name given; otherwise, Optional Input	Contains addressing information for the remote responder
input_dcb-> called_ae_title_option	Optional Input	Dictates the interpretation of called_ae_title If it indicates Dir_dist_name_option, called_dir_name must be usable as an address for the remote responder Default is No_value_option
input_dcb-> called_ae_title	Optional Input	Optional ae_title sent to the peer AE Can be either a directory distinguished name or an object_id Determined by how you set called_ae_title_option
input_dcb-> called_ae_invoke_id	Optional Input	HP-UX responders accept, but ignore, this undefined value; default setting is NO_VALUE
input_dcb-> called_ap_invoke_id	Optional Input	HP-UX responders accept, but ignore, this undefined value; default setting is NO_VALUE
input_dcb-> number_of_retry	Optional Input	Number of times (in tenths of seconds) to retry the connection attempt; default is zero
input_dcb-> delay_between_retry	Optional Input	Amount of time (in tenths of seconds) to wait between retrying to establish the connection; default is zero
input_dcb->connection_ resource_wait_timer	Optional Input	Maximum time (in tenths of seconds) to wait for an available association resource; default is zero
input_dcb-> context_name	Mandatory Input	Association Control Service Element (ACSE) context name; you must set this value to 1 0 8571 1 1

ft_connect() Parameter	Type	Description
input_dcb->connect_ in_info.service_class	Mandatory Input	Determines whether you transfer, access, or manage a file on this connection
input_dcb->connect_ in_info.functional_units	Mandatory Input	Determines which functions are available per connection
input_dcb->connect_ in_info.attribute_groups	Mandatory Input	Specifies the set of attributes (level of support) available on the association
input_dcb->connect_in_ info.quality_of_service	Optional Input	Determines the level of available recovery; FTAM does not automatically attempt recovery
input_dcb->connect_in_ info.contents_type_list	Optional Input	Specifies the allowable document type for the connection
input_dcb->connect_in_ info.initiator_identity	Optional Input	Login account name, which must exist on the node to which you are connecting
input_dcb->connect_ in_info.account	Optional Input	HP-UX responders accept, but ignore, this value
input_dcb->connect_in_ info.file_store_pw	Optional Input	Login password for the initiator_identity
inout_dcb->size	Mandatory input if using inout_dcb	Size (in Octets) of the inout_dcb structure and data
inout_dcb->result	Output	Pointer to the struct Api_rc containing the outcome of the operation: result_code and vendor_code (HP-UX—specific error)
inout_dcb->responding_ presentation_address	Output	presentation_address returned by the responder
inout_dcb-> responding_ae	Output	ae_title returned by the responder
inout_dcb->responding_ ae_invoke_id	Output	HP-UX responders accept, but ignore this undefined value
inout_dcb->responding_ ap_invoke_id	Output	HP-UX responders accept, but ignore this undefined value

ft_connect() Parameter	Type	Description
inout_dcb-> context_name	Output	context_name accepted by the responder
inout_dcb->connect_ out_info->state_result	Output	Indicates whether the request moved through regimes; if a failure returns, you will also receive an action_result of FT_AR_PERMANENT_ERROR
inout_dcb->connect_ out_info->action_result	Output	Specifies the overall success or failure of the request
inout_dcb->connect_ out_info->service_class	Output	Highest service_class the responder supports
inout_dcb-> connect_out_info-> functional_unit	Output	functional_units accepted by the responder
inout_dcb-> connect_out_info-> attribute_groups	Output	attribute_groups accepted by the responder
inout_dcb-> connect_out_info-> quality_of_service	Output	Level of available recovery; FTAM does not automatically attempt recovery
inout_dcb-> connect_out_info-> contents_type_list	Output	contents_types (document types) accepted by the responder
inout_dcb->connect_ out_info->diagnostic	Output	Provides ISO-specific error information
inout_dcb->connect_ out_info->acse_result	Output	Indicates overall result of ACSE processing
inout_dcb-> connect_out_info-> acse_diagnostic	Output	Provides Association Control Service Element (ACSE) diagnostic information
connection_id	Output	Uniquely identifies the connection to the filestore; use this connection_id as input to subsequent calls to identify the connection

ft_rrequest()

```
#include %</opt/ftam/include/map.h>
#include %</opt/ftam/include/mapftam.h>
Return_code
ft_rrequest (connection_id, return_event_name, input_dcb,
             inout_dcb)
Connection_id                   connection_id;
Local_event_name                return_event_name;
struct Ft_relreq_in_dcb         *input_dcb;
struct Ft_relreq_out_dcb        **inout_dcb;
```

Use ft_rrequest to release a specific connection; afterwards, the connection no longer exists; you must establish a new connection (using ft_connect()).

The ft_rrequest() input_dcb parameter does not contain information; therefore, pass a NULL pointer for the input_dcb parameter.

Ft_relreq_in_dcb

```
struct  Ft_relreq_in_dcb {
        struct Ft_release_req_info   release_in_info;
};
struct Ft_release_req_info {
        char      *ft_rel_info;
};
```

Ft_relreq_out_dcb

```
struct  Ft_relreq_out_dcb {
        Uint32                          size;
        struct  Api_rc                  result;
        struct  Ft_release_cnf_info     *output_info;
};

struct  Ft_release_cnf_info {
        struct  Ft_charging    *charging;
};
```

ft_rrequest() Parameters

ft_rrequest() Parameter	Type	Description
connection_id	Mandatory Input	Uniquely identifies the connection you want to release
return_event_name	Mandatory Input	If the call is asynchronous, uniquely identifies the function call; if the call is synchronous, the value is 0 (zero)
input_dcb	Optional Input	Contains no information; pass a NULL pointer
inout_dcb->size	Mandatory input if using inout_dcb	Size (in Octets) of the inout_dcb structure and data
inout_dcb->result	Output	Pointer to the struct Api_rc containing the outcome of the operation: result_code and vendor_code (HP-UX—specific error)
inout_dcb->output_ info->charging	Output	HP-UX responders do not use charging, though it may contain information from other responders

ft_aereset()

```
#include %</opt/ftam/include/map.h>
#include %</opt/ftam/include/mapftam.h>
Return_code
ft_aereset(ae_label, return_event_name, inout_dcb)
Ae_label                        ae_label;
Local_event_name                return_event_name;
struct Ft_output                **inout_dcb;
```

Use ft_aereset() to abort all open connections and return ftam_init to its initial state.

Ft_output

```
struct  Ft_output {
        Uint32                  size;
        struct  Api_rc          result;
};
```

ft_aereset() Parameters

ft_aereset() Parameter	Type	Description
ae_label	Mandatory Input	Uniquely identifies the AE (ftam_init) you want to reset
return_event_name	Mandatory Input	If the call is asynchronous, uniquely identifies the function call; if the call is synchronous, the value is 0 (zero)
inout_dcb->size	Mandatory input if using inout_dcb	Size (in Octets) of the inout_dcb structure and data
inout_dcb->result	Output	Pointer to the struct Api_rc containing the outcome of the operation: result_code and vendor_code (HP-UX—specific error)

Aborting Connections

Use ft_abort() to abort a connection and ft_ireceive() to determine why you received an abort indication.

ft_abort()

```
#include %</opt/ftam/include/map.h>
#include %</opt/ftam/include/mapftam.h>
Return_code
ft_abort(connection_id, return_event_name, input_dcb,
         inout_dcb)
Connection_id                connection_id;
Local_event_name             return_event_name;
struct Ft_abort_in_dcb       *input_dcb;
struct Ft_output             **inout_dcb;
```

Use ft_abort() to abruptly terminate a connection at any time (i.e., in any regime).

NOTE If you abort while writing data, you could lose any or all data written during that transfer; you will not, however, lose the source file.

Ft_abort_in_dcb

```
struct    Ft_abort_in_dcb {
          struct  Ft_abort_req_info    info;
};


struct  Ft_abort_req_info {
        enum  Ft_action_result        action_result;
        struct  Ft_diagnostic         *diagnostic;
};
```

Ft_output

```
struct  Ft_output {
        Uint32               size;
        struct  Api_rc       result;
};
```

ft_abort() Parameters

ft_abort() Parameter	Type	Description
connection_id	Mandatory Input	Uniquely identifies the specific filestore connection to abort
return_event_name	Mandatory Input	If the call is asynchronous, uniquely identifies the function call; if the call is synchronous, the value is 0 (zero)
input_dcb-> info.action_result	Mandatory Input	Conveys the reason for the abort
input_dcb-> info.diagnostic	Optional Input	ISO-specific error information; HP-UX responders accept, but ignore, this value
inout_dcb->size	Mandatory input if using inout_dcb	Size (in Octets) of the inout_dcb structure and data
inout_dcb->result	Output	Pointer to the struct Api_rc containing the outcome of the operation: result_code and vendor_code (HP-UX—specific error)

ft_ireceive()

```
#include %</opt/ftam/include/map.h>
#include %</opt/ftam/include/mapftam.h>
Return_code
ft_ireceive(connection_id, return_event_name, inout_dcb,
            indication_name)
Connection_id                   connection_id;
Local_event_name                return_event_name;
struct Ft_indication_out_dcb    *inout_dcb;
Uint32                          *indication_name;
```

If you receive the FTE003_ABORT_IND_RCVD error, call ft_ireceive()

- to determine whether the abort was caused by the system (initiator, responder, or network) or by a user, and
- to receive diagnostics.

The information regarding the type of abort returns in the indication_name parameter and may be useful for troubleshooting purposes.

All diagnostics associated with the abort are returned in the inout_dcb.

Ft_indication_out_dcb

```
struct  Ft_indication_out_dcb {
        Uint32                                  size;
        struct  Api_rc                          result;
        union   Ft_specific_indication_info     info;
};


union  Ft_specific_indication_info {
       struct Ft_aabort_ind_info                aabort_info;
       struct Ft_pabort_ind_info                pabort_info;
};


struct  Ft_aabort_ind_info {
        enum Ft_action_result                  action_result;
        struct Ft_diagnostic                   *diagnostic;
};


struct  Ft_pabort_ind_info {
        enum  Ft_action_result                 action_result;
        struct  Ft_diagnostic                  *diagnostic;
};
```

ft_ireceive() Parameters

ft_ireceive() Parameter	Type	Description
connection_id	Mandatory Input	Uniquely identifies the aborted connection
return_event_name	Mandatory Input	If the call is asynchronous, uniquely identifies the function call; if the call is synchronous, the value is 0 (zero)
inout_dcb->size	Mandatory input if using inout_dcb	Size (in Octets) of the inout_dcb structure and data
inout_dcb->result	Output	Pointer to the struct Api_rc containing the outcome of the operation: result_code and vendor_code (HP-UX—specific error)
inout_dcb->info. aabort_info.action_result	Output	Specifies that an application caused the abort Specifies the overall success or failure of the request
inout_dcb->info. aabort_info.diagnostic	Output	Specifies that an application caused the abort; provides ISO-specific error information
inout_dcb->info. pabort_info.action_result	Output	Specifies that the system caused the abort Specifies the overall success or failure of the request
inout_dcb->info. pabort_info.diagnostic	Output	Specifies that the system caused the abort; provides ISO-specific error information
indication_name	Output	Specifies if the abort was a system (FT_PABORT_IND) or application (FT_AABORT_IND) abort; dictates which union Ft_specific_indication_info contains the output information

7 Managing and Accessing HP FTAM/9000 Files

After establishing connections, you can manage and access FTAM files. Refer to the “Example Programs” chapter for model programs using these functions.

Chapter Overview

This chapter describes the following functions in the order listed.

Task to Perform	Function Used to Perform the Task	Description
Gaining Access to Files	ft_create()	Create files
	ft_select()	Select files
	ft_open()	Open files (LLCS)
	ft_close()	Close files (LLCS)
	ft_delete()	Delete files (LLCS)
	ft_deselect()	Deselect files
Opening and Closing Files	ft_fopen()	Select or create, and then open files (HLCS)
	ft_fclose()	Close and then deselect or delete files (HLCS)
Reading and Changing Attributes	ft_rattributes()	Read attributes (LLCS)
	ft_cattributes()	Change attributes (LLCS)
Locating and Erasing FTAM Files	ft_locate()	Locate FADUs within files
	ft_erase()	Erase files
Grouping FTAM Functions	ft_bgroup()	Begin a group of FTAM calls
	ft_egroup()	End a group of FTAM calls

NOTE This chapter does not explain the parameter structures. For detailed structure information (parameter settings), refer to the “FTAM Data Structures” chapter.

Gaining Access to FTAM Files

After establishing a connection, either select (ft_select()) or create (ft_create()) a file for further manipulation. You must always select a file before opening it (ft_open()), though the selection automatically occurs if you create the file.

After performing FTAM operations, close (ft_close()) the file and then deselect (ft_deselect()) or delete (ft_delete()) it. The file remains intact if you deselect it; if you delete the file, it no longer exists.

ft_create()

```
#include %</opt/ftam/include/map.h>
#include %</opt/ftam/include/mapftam.h>

Return code
ft_create (connection_id, filename, contents_type,
          requested_access, file_status, return_event_name,
          input_dcb, inout_dcb)

Connection_id                          connection_id;
Ft_filename                            filename;
struct Ft_contents_type                contents_type;
Ft_file_actions                        requested_access;
enum Ft_file_status                    file_status;
Local_event_name                       return_event_name;
struct Ft_create_in_dcb                *input_dcb;
struct Ft_create_out_dcb               **inout_dcb;
```

Use ft_create() to create a new file. If successful, ft_create() automatically selects the file.

- Invoke ft_create() in the FTAM regime to move to the File Selection regime.
- During ft_connect(), you must negotiate the FT_FU_LTD_MGMT functional_units to use ft_create().
- If the file already exists, the file_status parameter determines whether a new file is created or the request fails. (Refer to the “Ft_file_status” section in the “FTAM Data Structures” chapter for options on setting this field.)

- The subset of the input_dcb->attributes.mask field (of type struct Ft_attributes) that is valid for ft_create() is as follows.

FT_AN_ACCESS_CONTROL	FT_AN_LEGAL_QUAL
FT_AN_FILE_AVAILABILITY	FT_AN_PERMITTED_ACTION
FT_AN_FUTURE_FILESIZE	S FT_AN_PRIVATE_USE
FT_AN_ID_OF_CREATOR	FT_AN_STORAGE_ACCOUNT

- If you do not specify permitted_actions, FTAM uses the requested_access values for the permitted_actions values.
- FTAM uses the exposed parameters filename and contents_type and does not use input_dcb->attributes.values.filename and input_dcb->attributes.values.contents_type.

Ft_create_in_dcb

```
struct  Ft_create_in_dcb {
      struct  Ft_attributes            attributes;
      struct  Ft_concurrency_control   *concurrency_control;
      Ft_single_file_pw                create_file_pw;
      struct  Ft_file_passwords        file_passwords;
      Ft_account                       account;
};
```

Ft_create_out_dcb

```
struct  Ft_create_out_dcb {
      Uint32                     size;
      struct  Api_rc             result;
      enum    Ft_state_result    state_result;
      enum    Ft_action_result   action_result;
      struct  Ft_attributes      attributes;
      struct  Ft_diagnostic      *diagnostic;
};
```

ft_create() Parameters

ft_create() Parameter	Type	Description
connection_id	Mandatory Input	Uniquely identifies a specific connection to the filestore
filename	Mandatory Input	Path name of the file you are creating; must be in the syntax of the real filestore
contents_type	Mandatory Input	Specifies the document type of the newly created file
requested_access	Mandatory Input	Specifies the actions you want available for the connection (during the File Selection regime and those regimes nested within it)
file_status	Mandatory Input	Determines the action to take if the file already exists
return_event_name	Mandatory Input	If the call is asynchronous, uniquely identifies the function call; if the call is synchronous, the value is 0 (zero)
input_dcb->attributes	Optional Input	Uniquely identifies the file you are creating; do not use input_dcb->attributes.filename and input_dcb->attributes.contents_type
input_dcb->concurrency_control	Optional Input	File access locks required on the actions specified in requested_access
input_dcb->create_file_pw	Optional Input	Establishes permission to create files in the current filestore; HP-UX responders ignore this value
input_dcb->file_passwords	Optional Input	Passwords associated with the actions specified by requested_access
input_dcb->account	Optional Input	HP-UX responders accept, but ignore, this value
inout_dcb->size	Mandatory input if using inout_dcb	Size (in Octets) of the inout_dcb structure and data

ft_create() Parameter	Type	Description
inout_dcb->result	Output	Pointer to the struct Api_rc containing the outcome of the operation: result_code and vendor_code (HP-UX—specific error)
inout_dcb-> state_result	Output	Indicates whether the request moved from the FTAM regime to the File Selection regime; if a failure returns, you will also receive an action_result of FT_AR_PERMANENT_ERROR
inout_dcb-> action_result	Output	Specifies the overall success or failure of the request
inout_dcb- >attributes	Output	Contains values of the attributes of the file you created (those attributes accepted by the responder)
inout_dcb- >diagnostic	Output	Provides ISO-specific error information

ft_select()

```
#include %</opt/ftam/include/map.h>
#include %</opt/ftam/include/mapftam.h>

Return_code
ft_select (connection_id, filename, requested_access,
           return_event_name, input_dcb, inout_dcb)

Connection_id                          connection_id;
Ft_filename                            filename;
Ft_file_actions                        requested_access;
Local_event_name                       return_event_name;
struct Ft_select_in_dcb                *input_dcb;
struct Ft_select_out_dcb               **inout_dcb;
```

Use ft_select() to choose an existing file for file management or access (e.g., reading attributes, opening a file). You select a file based only on its filename.

- Invoke ft_select() in the FTAM regime to move to the File Selection regime.

- FTAM uses the exposed parameters filename and contents_type and does not use the corresponding values stored in input_dcb->attributes.
- If the file you are selecting has access control, the following conditions exist.
  - The requested_access parameter must be a subset of the values stored in action_list field in struct Ft_access_control_element.
  - FTAM will detect conflicts between the initiator_id and the identity field of the access_control_element.
  - The HP-UX implementation of FTAM does not use the file_passwords parameter. Other implementations might.

Ft_select_in_dcb

```
struct  Ft_select_in_dcb {
      struct  Ft_attributes            attributes;
      struct  Ft_file_passwords        file_passwords;
      Ft_account                       account;
      struct  Ft_concurrency_control   *concurrency_control;
};
```

Ft_select_out_dcb

```
struct  Ft_select_out_dcb {
      Uint32                        size;
      struct  Api_rc                result;
      enum    Ft_state_result       state_result;
      enum    Ft_action_result      action_result;
      struct  Ft_attributes         attributes;
      struct  Ft_diagnostic         *diagnostic;
};
```

ft_select() Parameters

ft_select() Parameter	Type	Description
connection_id	Mandatory Input	Uniquely identifies a specific connection to the filestore
filename	Mandatory Input	Path name of the file you are selecting; must be in the syntax of the real filestore

ft_select() Parameter	Type	Description
requested_access	Mandatory Input	Specifies the actions you want available for the connection (during the File Selection regime and those regimes nested within it)
return_event_name	Mandatory Input	If the call is asynchronous, uniquely identifies the function call; if the call is synchronous, the value is 0 (zero)
input_dcb->attributes	Optional input	FTAM does not use this field; provided for future use
input_dcb->file_passwords	Optional Input	Passwords associated with the actions specified by requested_access
input_dcb->account	Optional Input	HP-UX responders accept, but ignore, this value
input_dcb->concurrency_control	Optional Input	File access locks required on the actions specified in requested_access
inout_dcb->size	Mandatory input if using inout_dcb	Size (in Octets) of the inout_dcb structure and data
inout_dcb->result	Output	Pointer to the struct Api_rc containing the outcome of the operation: result_code and vendor_code (HP-UX—specific error)
inout_dcb->state_result	Output	Indicates whether the request moved from the FTAM to the File Selection regime; if a failure returns, you will also receive an action_result of FT_AR_PERMANENT_ERROR
inout_dcb->action_result	Output	Specifies the overall success or failure of the request
inout_dcb->attributes	Output	Contains values of the filename attribute of the file you selected HP-UX responders accept, but ignore, this value
inout_dcb->diagnostic	Output	Provides ISO-specific error information

ft_open() (LLCS)

```
#include %</opt/ftam/include/map.h>
#include %</opt/ftam/include/mapftam.h>

Return_code
ft_open (connection_id, processing_mode, contents_type,
         return_event_name, input_dcb, inout_dcb)

Connection_id                          connection_id;
Ft_processing_mode                     processing_mode;
struct Ft_contents_type                contents_type;
Local_event_name                       return_event_name;
struct Ft_open_in_dcb                  *input_dcb;
struct Ft_open_out_dcb                 **inout_dcb;
```

Use ft_open() after selecting or creating a file to access operations.

- Invoke ft_open() in the File Selection regime to move to the File Open regime.
- During ft_connect(), you must negotiate the FT_FU_READ or FT_FU_WRITE functional_units to use ft_open().
- The input_dcb->concurrency_control parameters must be the same or more restrictive than the input_dcb->concurrency_control parameters set on ft_create() and ft_select().
- If the file you are opening has access control, the following conditions exist:
  - The processing_mode parameter must be a subset of the values stored in action_list field in the access_control_element corresponding to the initiator_id used to establish the connection.
  - The HP-UX implementation of FTAM does not use the file_passwords parameter. Other implementations might.

Ft_open_in_dcb

```
struct  Ft_open_in_dcb  {
      struct  Ft_concurrency_control   *concurrency_control;
};
```

Ft_open_out_dcb

```
struct  Ft_open_out_dcb {
      Uint32                          size;
      struct  Api_rc                  result;
      enum    Ft_state_result         state_result;
      enum    Ft_action_result        action_result;
      struct  Ft_contents_type        contents_type;
      struct  Ft_concurrency_control  *concurrency_control;
      struct  Ft_diagnostic           *diagnostic;
};
```

ft_open() Parameters

ft_open() Parameter	Type	Description
connection_id	Mandatory Input	Uniquely identifies a specific connection to the filestore
processing_mode	Mandatory Input	Establishes a valid subset of actions negotiated in the File Selection regime
contents_type	Mandatory Input	Specifies the document type
return_event_name	Mandatory Input	If the call is asynchronous, uniquely identifies the function call; if the call is synchronous, the value is 0 (zero)
input_dcb-> concurrency_control	Optional Input	File access locks required on the actions specified in requested_access
inout_dcb->size	Mandatory input if using inout_dcb	Size (in Octets) of the inout_dcb structure and data
inout_dcb->result	Output	Pointer to the struct Api_rc containing the outcome of the operation: result_code and vendor_code (HP-UX—specific error)

ft_open() Parameter	Type	Description
inout_dcb-> state_result	Output	Indicates whether the request moved from the File Selection to the File Open regime; if a failure returns, you will also receive an action_result of FT_AR_PERMANENT_ERROR
inout_dcb-> action_result	Output	Specifies the overall success or failure of the request
inout_dcb-> contents_type	Output	contents_type of the opened file (as accepted by the responder)
inout_dcb-> concurrency_control	Output	concurrency_control of the opened file (as accepted by the responder)
inout_dcb->diagnostic	Output	Provides ISO-specific error information

ft_close() (LLCS)

```
#include %</opt/ftam/include/map.h>
#include %</opt/ftam/include/mapftam.h>

Return_code
ft_close (connection_id, return_event_name, input_dcb,
          inout_dcb)

Connection_id                          connection_id;
Local_event_name                       return_event_name;
char                                   *input_dcb;
struct Ft_close_out_dcb                **inout_dcb;
```

Use ft_close() to close a file when you finish processing it. After closing the file, the only actions you can perform on the file without re-opening it are ft_deselect(), ft_delete(), ft_rattributes(), and ft_cattributes().

- The ft_close() input_dcb parameter does not contain information; therefore, pass a NULL pointer for the input_dcb parameter.
- Invoke ft_close() in the File Open regime to return to the File Selection regime.

Ft_close_out_dcb

```
struct  Ft_close_out_dcb {
      Uint32                        size;
      struct  Api_rc                result;
      enum  Ft_action_result        action_result;
      struct  Ft_diagnostic         *diagnostic;
};
```

ft_close() Parameters

ft_close() Parameter	Type	Description
connection_id	Mandatory Input	Uniquely identifies a specific connection to the filestore
return_event_name	Mandatory Input	If the call is asynchronous, uniquely identifies the function call; if the call is synchronous, the value is 0 (zero)
input_dcb	Optional input	Contains no information; pass a NULL pointer
inout_dcb->size	Mandatory input if using inout_dcb	Size (in Octets) of the inout_dcb structure and data
inout_dcb->result	Output	Pointer to the struct Api_rc containing the outcome of the operation: result_code and vendor_code (HP-UX—specific error)
inout_dcb-> action_result	Output	Specifies the overall success or failure of the request
inout_dcb- >diagnostic	Output	Provides ISO-specific error information

ft_delete() (LLCS)

```
#include %</opt/ftam/include/map.h>
#include %</opt/ftam/include/mapftam.h>

Return_code
ft_delete (connection_id, return_event_name, input_dcb,
           inout_dcb)

Connection_id                              connection_id;
Local_event_name                           return_event_name;
char                                       *input_dcb;
struct Ft_delete_out_dcb                   **inout_dcb;
```

Use ft_delete() to remove a file from the filestore.

- The ft_delete() input_dcb parameter does not contain information; therefore, pass a NULL pointer for the input_dcb parameter.
- Invoke ft_delete() in the File Selection regime to move back to the FTAM regime after deleting the file.
- During ft_connect(), you must negotiate the FT_FU_LTD_MGMT functional_units to use ft_delete().
- During ft_select(), ft_create(), and ft_fopen() you must specify FT_FA_DELETE_FILE in requested_access to use ft_delete().

Ft_delete_out_dcb

```
struct  Ft_delete_out_dcb  {
      Uint32                       size;
      struct  Api_rc               result;
      enum  Ft_action_result       action_result;
      struct  Ft_charging          *charging;
      struct  Ft_diagnostic        *diagnostic;
};
```

ft_delete() Parameters

ft_close() Parameter	Type	Description
connection_id	Mandatory Input	Uniquely identifies a specific connection to the filestore
return_event_name	Mandatory Input	If the call is asynchronous, uniquely identifies the function call; if the call is synchronous, the value is 0 (zero)
input_dcb	Optional input	Contains no information; pass a NULL pointer
inout_dcb->size	Mandatory input if using inout_dcb	Size (in Octets) of the inout_dcb structure and data
inout_dcb->result	Output	Pointer to the struct Api_rc containing the outcome of the operation: result_code and vendor_code (HP-UX—specific error)
inout_dcb-> action_result	Output	Specifies the overall success or failure of the request
inout_dcb-> charging	Output	HP-UX responders do not use charging, though it may contain information from other responders
inout_dcb- >diagnostic	Output	Provides ISO-specific error information

ft_deselect()

```
#include %</opt/ftam/include/map.h>
#include %</opt/ftam/include/mapftam.h>

Return_code
ft_deselect (connection_id, return_event_name, input_dcb,
             inout_dcb)

Connection_id                              connection_id;
Local_event_name                           return_event_name;
char                                       *input_dcb;
struct Ft_deselect_out_dcb                 **inout_dcb;
```

Use ft_deselect() to deselect a file when you finish processing, but do not want to remove it. You must re-select the file to perform further actions on it.

- The ft_deselect() input_dcb parameter does not contain information; therefore, pass a NULL pointer for the input_dcb parameter.
- Invoke ft_deselect() in the File Selection regime to move back to the FTAM regime.

Ft_deselect_out_dcb

```
struct  Ft_deselect_out_dcb {
      Uint32                       size;
      struct  Api_rc               result;
      enum    Ft_action_result     action_result;
      struct  Ft_charging          *charging;
      struct  Ft_diagnostic        *diagnostic;
};
```

ft_deselect() Parameters

ft_deselect() Parameter	Type	Description
connection_id	Mandatory Input	Uniquely identifies a specific connection to the filestore
return_event_name	Mandatory Input	If the call is asynchronous, uniquely identifies the function call; if the call is synchronous, the value is 0 (zero)
input_dcb	Optional input	Contains no information; pass a NULL pointer

ft_deselect() Parameter	Type	Description
inout_dcb->size	Mandatory input if using inout_dcb	Size (in Octets) of the inout_dcb structure and data
inout_dcb->result	Output	Pointer to the struct Api_rc containing the outcome of the operation: result_code and vendor_code (HP-UX—specific error)
inout_dcb-> action_result	Output	Specifies the overall success or failure of the request
inout_dcb- >charging	Output	HP-UX responders do not use charging, though it may contain information from other responders
inout_dcb- >diagnostic	Output	Provides ISO-specific error information

Opening and Closing Files (HLCS)

Use ft_fopen() and ft_fclose() to open and close files, respectively, using only one high level call.

ft_fopen()	Either selects or creates, and then opens a file
ft_fclose()	Closes a file, and then either deselects or deletes a file

ft_fopen() (HLCS)

```
#include %</opt/ftam/include/map.h>
#include %</opt/ftam/include/mapftam.h>

Return_code
ft_fopen (connection_id, filename, file_status,
         requested_access, contents_type, return_event_name,
         input_dcb, inout_dcb)

Connection_id                          connection_id;
Ft_filename                            filename;
enum   Ft_file_status                  file_status;
Ft_file_actions                        requested_access;
struct Ft_contents_type                contents_type;
Local_event_name                       return_event_name;
struct Ft_fopen_in_dcb                 *input_dcb;
struct Ft_fopen_out_dcb                **inout_dcb;
```

Use ft_fopen() to create or select a file and then open it with one call (rather than invoking the low level calls ft_select() or ft_create() with ft_open()).

- Invoke ft_fopen() in the FTAM regime to move to the File Open regime.
- If the file already exists, the file_status parameter determines whether a new file is created or the request fails. (Refer to the “Ft_file_status” section in the “FTAM Data Structures” chapter for options on setting this field.)

- If the file you are selecting and opening has access control, the following conditions exist.
  - The requested_access parameter must be a subset of the values stored in action_list field in the access_control_element corresponding to the initiator_id used to establish the connection.
  - FTAM will detect conflicts between the initiator_id and the identity field of the access_control_element.
  - The HP-UX implementation of FTAM does not use the file_passwords parameter. Other implementations might.
- If you create a new file, the returned file attributes are in the inout_dcb->attributes.
- FTAM uses the exposed parameters filename and contents_type and does not use input_dcb->attributes.values.filename and input_dcb->attributes.values.contents_type.
- If you do not specify permitted_actions, FTAM uses requested_access for permitted_actions.
- The processing_mode parameter used when the file is opened includes all file actions set in requested_access that are valid in the File Open regime.
- If you are selecting and opening a file, but do not know what the document type is, set contents_type.contents_form to FT_CONTENTS_UNKNOWN.

Ft_fopen_in_dcb

```
struct  Ft_fopen_in_dcb {
        struct  Ft_attributes           attributes;
        struct  Ft_concurrency_control  *concurrency_control;
        struct  Ft_file_passwords       file_passwords;
        Ft_account                      account;
};
```

Ft_fopen_out_dcb

```
struct  Ft_fopen_out_dcb {
        Uint32                          size;
        struct Api_rc                   result;
        enum    Ft_state_result         state_result;
        enum    Ft_action_result        action_result;
        struct  Ft_attributes           attributes;
        struct  Ft_concurrency_control  *concurrency_control;
        struct  Ft_diagnostic           *diagnostic;
};
```

ft_fopen() Parameters

ft_fopen() Parameter	Type	Description
connection_id	Mandatory Input	Uniquely identifies a specific connection to the filestore
filename	Mandatory Input	Path name of the file you are opening; must be in the syntax of the real filestore
file_status	Mandatory Input	Determines the action to take if the file already exists
requested_access	Mandatory Input	Specifies the actions you want to perform on the file
contents_type	Mandatory Input	Specifies the document type of the file you are creating or opening
return_event_name	Mandatory Input	If the call is asynchronous, uniquely identifies the function call; if the call is synchronous, the value is 0 (zero)
input_dcb->attributes	Optional	Uniquely identifies the file you are creating and opening; do not use input_dcb->attributes.values.filename or input_dcb->attributes.values.contents_type
input_dcb->concurrency_control	Optional	File access locks required on the actions specified in requested_access
input_dcb->file_passwords	Optional	Passwords associated with the actions specified by requested_access

ft_fopen() Parameter	Type	Description
input_dcb->account	Optional	HP-UX responders accept, but ignore, this value
inout_dcb->size	Mandatory input if using inout_dcb	Size (in Octets) of the inout_dcb structure and data
inout_dcb->result	Output	Pointer to the struct Api_rc containing the outcome of the operation: result_code and vendor_code (HP-UX—specific error)
inout_dcb-> state_result	Output	Indicates whether the request moved through regimes; if a failure returns, you will also receive an action_result of FT_AR_PERMANENT_ERROR
inout_dcb-> action_result	Output	Specifies the overall success or failure of the request
inout_dcb- >attributes	Output	If you created the file, contains values of the attributes of the file (those attributes accepted by the responder); if you selected the file, contains values of the filename and contents_type attributes
inout_dcb-> concurrency_control	Output	concurrency_control of the opened file (as accepted by the responder)
inout_dcb- >diagnostic	Output	Provides ISO-specific error information

ft_fclose() (HLCS)

```
#include %</opt/ftam/include/map.h>
#include %</opt/ftam/include/mapftam.h>

Return_code
ft_fclose (connection_id, delete_action,
           return_event_name, input_dcb, inout_dcb)

Connection_id                          connection_id;
enum Ft_delete_action                  delete_action;
Local_event_name                       return_event_name;
char                                   *input_dcb;
struct Ft_fclose_out_dcb               **inout_dcb;
```

Use ft_fclose() to close a file, and then either deselect or delete it (rather than invoking the low level ft_close() function with ft_deselect() or ft_delete()).

- Invoke ft_fclose() in the File Open regime to move back to the FTAM regime.
- The delete_action parameter determines whether the file is deleted or deselected.
- The ft_close() input_dcb parameter does not contain information; therefore, pass a NULL pointer for the input_dcb parameter.

Ft_fclose_out_dcb

```
struct  Ft_fclose_out_dcb {
        Uint32                      size;
        struct  Api_rc              result;
        enum    Ft_action_result    action_result;
        struct  Ft_diagnostic       *diagnostic;
};
```

ft_fclose() Parameters

ft_fclose() Parameter	Type	Description
connection_id	Mandatory Input	Uniquely identifies a specific connection to the filestore
delete_action	Mandatory Input	Determines whether to delete or deselect the file
return_event_name	Mandatory Input	If the call is asynchronous, uniquely identifies the function call; if the call is synchronous, the value is 0 (zero)
input_dcb	Optional input	Contains no information; pass a NULL pointer
inout_dcb->size	Mandatory input if using inout_dcb	Size (in Octets) of the inout_dcb structure and data
inout_dcb->result	Output	Pointer to the struct Api_rc containing the outcome of the operation: result_code and vendor_code (HP-UX—specific error)
inout_dcb-> action_result	Output	Specifies the overall success or failure of the request
inout_dcb- >diagnostic	Output	Provides ISO-specific error information

Reading and Changing Attributes (LLCS)

Use the ft_rattributes() and ft_cattributes() to read and change attributes using low level calls.

If you are already in the File Selection regime, it is faster and easier to use low level calls to read and change attributes than to use high level calls (which re-connect and re-select). In other cases, the high level calls may be easier to use.

ft_rattributes() (LLCS)

```
#include %</opt/ftam/include/map.h>
#include %</opt/ftam/include/mapftam.h>

Return_code
ft_rattributes (connection_id, return_event_name, input_dcb,
                inout_dcb)

Connection_id                          connection_id;
Local_event_name                       return_event_name;
char                                   *input_dcb;
struct Ft_rattributes_out_dcb          **inout_dcb;
```

Use ft_rattributes() to read attributes.

- Invoke ft_rattributes() in the File Selection regime; you do not move to another regime.
- During ft_connect(), you must negotiate the FT_FU_LTD_MGMT functional_units to use ft_rattributes().
- During ft_select(), you must specify FT_FA_READ_ATTRIBUTE in requested_access.
- Use input_dcb->attribute_names to specify which attributes you want to read. The attributes you read return in inout_dcb->attributes.
- HP-UX responders return the indication no value available (0) for the attributes legal_qualification, private_use, future_filesize, and storage_account.

Ft_rattributes_in_dcb

```
struct  Ft_rattributes_in_dcb {
      Ft_attribute_names    attribute_names;
};
```

Ft_rattributes_out_dcb

```
struct  Ft_rattributes_out_dcb {
      Uint32                        size;
      struct  Api_rc                result;
      enum  Ft_action_result        action_result;
      struct  Ft_attributes         attributes;
      struct  Ft_diagnostic         *diagnostic;
};
```

ft_rattributes() Parameters

ft_rattributes() Parameter	Type	Description
connection_id	Mandatory Input	Uniquely identifies a specific connection to the filestore
return_event_name	Mandatory Input	If the call is asynchronous, uniquely identifies the function call; if the call is synchronous, the value is zero
input_dcb-> attribute_names	Optional Input	Indicates the file attributes to read; default is all file attributes associated with the attribute groups negotiated on ft_connect()
inout_dcb->size	Mandatory input if using inout_dcb	Size (in Octets) of the inout_dcb structure and data
inout_dcb->result	Output	Pointer to the struct Api_rc containing the outcome of the operation

ft_rattributes() Parameter	Type	Description
inout_dcb-> action_result	Output	Specifies the overall success or failure of the request
inout_dcb- >attributes	Output	Contains values of the attributes of the file you read (those attributes accepted by the responder)
inout_dcb- >diagnostic	Output	Holds ISO-specific error information

ft_cattributes() (LLCS)

```
#include %</opt/ftam/include/map.h>
#include %</opt/ftam/include/mapftam.h>

Return_code
ft_cattributes (connection_id, return_event_name, input_dcb,
                inout_dcb)

Connection_id                          connection_id;
Local_event_name                       return_event_name;
struct Ft_cattributes_in_dcb           *input_dcb;
struct Ft_cattributes_out_dcb          **inout_dcb;
```

Use ft_cattributes() to change file attributes. For example, you can change an attribute such as access_control to allow a specific user to access a file.

- Invoke ft_cattributes() in the File Selection regime; you do not move to another regime.
- During ft_connect(), you must negotiate the FT_FU_ENH_MGMT functional_units to use ft_cattributes().
- During ft_select(), you must specify FT_FA_CHANGE_ATTRIBUTE in requested_access.
- The attributes_ groups negotiated on the ft_connect() request dictates the attributes you can change.
- The input_dcb->attribute_names parameters takes precedence over the input_dcb->attributes.mask field.

Attributes You Can Change	Attributes You Cannot Change
access_control	contents_type
file_availability	date_time_of_attribute_mod
filename	date_time_of_creation
future_filesize*	date_time_of_modification
legal_qualification*	date_time_of_read
private_use*	filesize
storage_account*	identity_of_attribute_mod
	identity_of_creator
	identity_of_modifier
	identity_of_reader
	permitted_actions

* HP-UX responders accept, but ignore, these values.

Ft_cattributes_in_dcb

```
struct  Ft_cattributes_in_dcb {
      Ft_attribute_names           attribute_names;
      struct  Ft_attributes        attributes;
};
```

Ft_cattributes_out_dcb

```
struct  Ft_cattributes_out_dcb {
      Uint32                       size;
      struct  Api_rc               result;
      enum    Ft_action_result     action_result;
      struct  Ft_attributes        attributes;
      struct  Ft_diagnostic        *diagnostic;
};
```

ft_cattributes() Parameters

ft_cattributes() Parameter	Type	Description
connection_id	Mandatory Input	Uniquely identifies a specific connection to the filestore
return_event_name	Mandatory Input	If the call is asynchronous, uniquely identifies the function call; if the call is synchronous, the value is 0 (zero)
input_dcb-> attribute_names	Mandatory Input	Mask that indicates which file attributes to change
input_dcb- >attributes	Mandatory Input	Specifies the values of the attributes to change; attributes.values contains new values for each attribute specified in attribute_names
inout_dcb->size	Mandatory input if using inout_dcb	Size (in Octets) of the inout_dcb structure and data
inout_dcb->result	Output	Pointer to the struct Api_rc containing the outcome of the operation: result_code and vendor_code (HP-UX—specific error)
inout_dcb-> action_result	Output	Specifies the overall success or failure of the request
inout_dcb- >attributes	Output	Contains values of the attributes you changed (those attributes accepted by the responder)
inout_dcb- >diagnostic	Output	Provides ISO-specific error information

Locating and Erasing FTAM Files

Use the ft_locate() to locate FADUs (FTAM-2) and ft_erase() to erase FTAM files.

ft_locate()

```
#include %</opt/ftam/include/map.h>
#include %</opt/ftam/include/mapftam.h>
Return_code
ft_locate (connection_id, fadu_identity,
           return_event_name, input_dcb, inout_dcb)
Connection_id                          connection_id;
Ft_fadu_identity                       fadu_identity;
Local_event_name                       return_event_name;
char                                   *input_dcb;
struct Ft_locate_out_dcb               **inout_dcb;
```

Use ft_locate() to locate a specific FADU within a file. Hence, use ft_locate() only on FTAM-2 document types. For example, you might want to locate the current FADU in an FTAM-2 file so that you can read it.

- The ft_locate() input_dcb parameter does not contain information; therefore, pass a NULL pointer for the input_dcb parameter.
- Invoke ft_locate() in the File Open regime; you do not move to another regime.
- During ft_connect(), you must negotiate the FT_FU_FILE_ACCESS functional_units to use ft_locate().

Ft_locate_out_dcb

```
struct  Ft_locate_out_dcb {
      Uint32                      size;
      struct  Api_rc              result;
      enum    Ft_action_result    action_result;
      struct  Ft_fadu_identity    *fadu_identity;
      struct  Ft_diagnostic       *diagnostic;
};
```

ft_locate() Parameters

ft_locate() Parameter	Type	Description
connection_id	Mandatory Input	Uniquely identifies a specific connection to the filestore
fadu_identity	Mandatory Input	Identifies the FADU to locate (FTAM-2 only)
return_event_name	Mandatory Input	If the call is asynchronous, uniquely identifies the function call; if the call is synchronous, the value is 0 (zero)
input_dcb	Optional input	Contains no information; pass a NULL pointer
inout_dcb->size	Mandatory input if using inout_dcb	Size (in Octets) of the inout_dcb structure and data
inout_dcb->result	Output	Pointer to the struct Api_rc containing the outcome of the operation: result_code and vendor_code (HP-UX—specific error)
inout_dcb-> action_result	Output	Specifies the overall success or failure of the request
inout_dcb-> fadu_identity	Output	fadu_identity of the FADU you located (FTAM-2 only)
inout_dcb- >diagnostic	Output	Provides ISO-specific error information

ft_erase()

```
#include %</opt/ftam/include/map.h>
#include %</opt/ftam/include/mapftam.h>
Return_code
ft_erase (connection_id, fadu_identity, return_event_name,
        input_dcb, inout_dcb)
Connection_id                          connection_id;
Ft_fadu_identity                       fadu_identity;
Local_event_name                       return_event_name;
char                                   *input_dcb;
struct Ft_erase_out_dcb                **inout_dcb;
```

Use ft_erase() to erase a file's contents; attributes are not erased.

- To erase the entire file's contents, the fadu_identity.fadu_location must be FT_FIRST for FTAM-1, FTAM-3, and INTAP-1 and must be FT_BEGIN for FTAM-2.
- The ft_erase() input_dcb parameter does not contain information; therefore, pass a NULL pointer for the input_dcb parameter.
- Invoke ft_erase() in the File Open regime; you do not move to another regime.
- During ft_connect(), you must negotiate the FT_FU_FILE_ACCESS functional_units to use ft_erase().
- During ft_open(), you must specify FT_PM_ERASE in processing_mode to use ft_erase().

Ft_erase_out_dcb

```
struct  Ft_erase_out_dcb {
      Uint16                        size;
      struct  Api_rc                result;
      enum    Ft_action_result      action_result;
      struct  Ft_diagnostic         *diagnostic;
};
```

ft_erase() Parameters

ft_locate() Parameter	Type	Description
connection_id	Mandatory Input	Uniquely identifies a specific connection to the filestore
fadu_identity	Mandatory Input	Identifies the FADU to erase
return_event_name	Mandatory Input	If the call is asynchronous, uniquely identifies the function call; if the call is synchronous, the value is zero.
input_dcb	Optional input	Contains no information; pass a NULL pointer
inout_dcb->size	Mandatory input if using inout_dcb	Size (in Octets) of the inout_dcb structure and data
inout_dcb->result	Output	Pointer to the struct Api_rc containing the outcome of the operation: result_code and vendor_code (HP-UX—specific error)
inout_dcb-> action_result	Output	Specifies the overall success or failure of the request
inout_dcb- >diagnostic	Output	Provides ISO-specific error information

Grouping LLCS FTAM Functions

Use ft_bgroup() and ft_egroup() to begin and end the grouping of low level FTAM functions and thus, increase performance. The ftam_init places these functions into one presentation service data unit (PSDU) before sending it across the network.

For a group to be successful, all functions moving from one regime to another must be successful (regardless of whether the calls that do not move through regimes succeed).

If a failure occurs on a function that crosses regimes and if the SUCCESS count does not equal or exceed threshold, no remaining calls, except ft_egroup(), are processed and you receive an error.

Allowable Groupings

Refer to the following guidelines for grouping FTAM functions and for reading the following table. The table lists the legal groupings with the associated sequence of LLCS functions (from left to right).

EXAMPLE: The first grouping (#1) in the table reads as follows.

1. Call ft_bgroup().
2. Call either ft_create() if the file does not exist or ft_select() if it does.
3. Call either or both ft_rattributes() and ft_cattributes().
4. Call ft_open() followed by ft_egroup().

- All groups must begin with ft_bgroup() and end with ft_egroup().
- The first function you want to call after ft_bgroup() determines which regime you must be in to call ft_bgroup().
- You must call all functions within the group asynchronously except for ft_egroup(), which can be synchronous or asynchronous.
- If more than one function is listed in a ``Mandatory'' column, you must perform both functions in the order listed.

- You can specify either or both optional functions, or can choose not to use them. If you call both optional functions, you must do so in the order given in the table.

Mandatory Beginning Functions	Must Have One of these Functions	Optional Functions	Must Have One of these Functions	Mandatory Ending Functions
#1 ft_bgroup()	ft_select() ft_create()	ft_rattributes() ft_cattributes()	ft_open()	ft_egroup()
#2 ft_bgroup()	ft_close()	ft_rattributes() ft_cattributes()	ft_deselect() ft_delete()	ft_egroup()
#3 ft_bgroup()	ft_select() ft_create()	ft_rattributes() ft_cattributes()	ft_deselect() ft_delete()	ft_egroup()
#4 ft_bgroup()	ft_select() ft_create()	ft_rattributes() ft_cattributes()		ft_egroup()
#5 ft_bgroup()		ft_rattributes() ft_cattributes()	ft_deselect() ft_delete()	ft_egroup()

The legal groupings are restricted by the service_class. Refer to the above table and the following list to determine these restrictions.

- If you select FT_SC_TRANSFER, you must use the #1 or #2 groupings.
- If you select FT_SC_MANAGEMENT, you must use the #3 grouping.
- If you select FT_SC_TRANSFER_AND_MGMT, you must use the #1, #2, or #3 groupings.
- If you select FT_SC_ACCESS, you can use any of the groupings.

If you select the service_class FT_SC_TRANSFER, FT_SC_MANAGEMENT, or FT_SC_TRANSFER_AND_MGT, you must use FT_FU_GROUPING in the functional_units parameter.

ft_bgroup()

```
#include %</opt/ftam/include/map.h>
#include %</opt/ftam/include/mapftam.h>
Return_code
ft_bgroup (connection_id, threshold, return_event_name,
          input_dcb, inout_dcb)
Connection_id                              connection_id;
Uint32                                     threshold;
Local_event_name                           return_event_name;
char                                       *input_dcb;
struct Ft_bgroup_out_dcb                   **inout_dcb;
```

Issue an asynchronous ft_bgroup() to start a set of grouped functions.

- You cannot nest an ft_bgroup() function within another ft_bgroup() function (i.e., you cannot invoke ft_bgroup() within another set of grouped functions).
- During ft_connect(), you must negotiate the FT_FU_GROUPING functional_units to use ft_bgroup().

Ft_bgroup_out_dcb

```
struct  Ft_bgroup_out_dcb  {
      Uint32            size;
      struct  Api_rc    result;
};
```

ft_bgroup() Parameters

ft_bgroup() Parameter	Type	Description
connection_id	Mandatory Input	Uniquely identifies a specific connection to the filestore
threshold	Mandatory Input	Specifies how many functions that change regimes must be successful for the group to be successful; set to a value between 1 and 5

ft_bgroup() Parameter	Type	Description
return_event_name	Mandatory Input	Uniquely identifies the asynchronous call
inout_dcb->size	Mandatory input if using inout_dcb	Size (in Octets) of the inout_dcb structure and data
inout_dcb->result	Output	Pointer to the struct Api_rc containing the outcome of the operation: result_code and vendor_code (HP-UX—specific error)

ft_egroup()

```
#include %</opt/ftam/include/map.h>
#include %</opt/ftam/include/mapftam.h>

Return_code
ft_egroup (connection_id, return_event_name, input_dcb,
          inout_dcb)

Connection_id                          connection_id;
Local_event_name                       return_event_name;
char                                   *input_dcb;
struct Ft_egroup_out_dcb               **inout_dcb;
```

Use ft_egroup(), either synchronously or asynchronously, to end a set of grouped functions.

- During ft_connect(), you must negotiate the FT_FU_GROUPING functional_units to use ft_egroup().
- An ft_egroup() is successful only if ft_bgroup() succeeds and if the threshold number of requests succeeds.

Ft_egroup_out_dcb

```
struct  Ft_egroup_out_dcb {
   Uint32           size;
   struct  Api_rc   result;
};
```

ft_egroup() Parameters

ft_egroup() parameter	Type	Description
connection_id	Mandatory Input	Uniquely identifies a specific connection to the filestore
return_event_name	Mandatory Input	If the call is asynchronous, uniquely identifies the function call; if the call is synchronous, the value is zero
inout_dcb->size	Mandatory input if using inout_dcb	Size (in Octets) of the inout_dcb structure and data
inout_dcb->result	Output	Pointer to the struct Api_rc containing the outcome of the operation: result_code and vendor_code (HP-UX—specific error)

8 Transferring HP FTAM/9000 Data

After opening a file, you can send and receive FTAM data. Refer to the “Example Programs” chapter for model programs using the functions described in the chapter.

Chapter Overview

This chapter describes the sequence of transferring data and describes the following functions in the order listed.

Task to Perform	Function Used to Perform the Task	Description
Reading Data	ft_read()	Specify the information to be read
	ft_rdata()	Receive data that was requested in ft_read() and QOS=0
	ft_rdataqos()	Receive data that was requested in ft_read() and QOS>0
Writing Data	ft_write()	Specify the information to write
	ft_sdata()	Send data that was requested in ft_write()
Ending Data Transfer	ft_edata()	End the sending of data
	ft_etransfer()	End data transfer
	ft_cancel()	Cancel the transferring of data
	ft_rcancel()	Acknowledge the cancel of data being transferred

NOTE This chapter does not explain the parameter structures. For detailed structure information (parameter settings), refer to the “FTAM Data Structures” chapter.

Sequence of Transferring Data

Sequences to use when transferring data are as follows.

1. ft_read()
2. ft_rdata() (multiple)
3. ft_etransfer()

1. ft_write()
2. ft_sdata() (multiple)
3. ft_edata()
4. ft_etransfer()

- If you invoke ft_read() or ft_write(), you must exit the regime by invoking ft_etransfer().
- If you invoke ft_sdata(), you must end the sending of data by invoking ft_edata().
- To prematurely terminate a data transfer after issuing ft_read() or ft_write(), call ft_cancel().
- You can receive a cancel indication any time; if you receive one, acknowledge it by calling ft_rcancel(). If you receive a cancel indication, you automatically exit the Data Transfer regime and move into the File Open regime.

Reading Data

Use ft_read() to identify what you want to read. To receive the identified information from the responder, call ft_rdata() to tell ftam_init the number of data elements you want to receive. The ftam_init gathers and returns the information requested.

ft_read()

```
#include %</opt/ftam/include/map.h>
#include %</opt/ftam/include/mapftam.h>
Return_code
ft_read (connection_id, fadu_identity, access_context,
        return_event_name, input_dcb, inout_dcb)
Connection_id                          connection_id;
struct Ft_fadu_identity                fadu_identity;
enum Ft_access_context                 access_context;
Local_event_name                       return_event_name;
char                                   *input_dcb;
struct Ft_read_out_dcb                 **inout_dcb;
```

Use ft_read() to identify the FADUs you want to read and to request that data be sent. Remember, FADUs may contain structure and data. Since FTAM-1, FTAM-3, and NBS-9 file type files contain only single FADUs, you must read the entire file. You can read individual FADUs within FTAM- 2 files. (Refer to the “HP-UX FTAM Overview” chapter for a description of FADUs. Refer to the “FTAM Data Structures” chapter for information on Ft_fadu_identity.)

- Invoke ft_read() in the File Open regime to move to the Data Transfer regime.
- During ft_connect(), you must negotiate the FT_FU_READ functional_units to use ft_read().
- During ft_create() and ft_select(), you must request FT_FA_READ in requested_access.
- The ft_read() input_dcb parameter does not contain information; therefore, pass a NULL pointer for the input_dcb parameter.
- To read an FTAM-1, FTAM-3, INTAP-1, or NBS-9 file, set fadu_identity of FT_FIRST. To read an entire FTAM-2 file, set fadu_identity to FT_BEGIN. To read a FADU within an FTAM-2 file, set fadu_identity to FT_FIRST or FT_NEXT.

- If you specify FT_UNSTRUCTURED_ALL_DATA_UNITS in access_context for FTAM-2 files, you receive only the data elements, not the node descriptors (structuring information). If you specify FT_FLAT_ALL_DATA_UNITS in access_context for FTAM-2 files, you receive both data elements and node descriptors.

Ft_read_out_dcb

```
struct    Ft_read_out_dcb {
        Uint32        size;
        struct        Api_rc    result;
};
```

ft_read() Parameters

ft_read() Parameter	Type	Description
connection_id	Mandatory Input	Uniquely identifies a specific connection to the filestore
fadu_identity	Mandatory Input	Identifies the FADU to read
access_context	Mandatory Input	Specifies the access context; depends on the document type
return_event_name	Mandatory Input	If the call is asynchronous, uniquely identifies the function call; if the call is synchronous, the value is zero
input_dcb	Optional Input	Contains no information; pass a NULL pointer
inout_dcb->size	Mandatory input if using inout_dcb	Size (in Octets) of the inout_dcb structure and data
inout_dcb->result	Output	Pointer to the struct Api_rc containing the outcome of the operation: result_code and vendor_code (HP-UX—specific error)

ft_rdata()

```
#include %</opt/ftam/include/map.h>
#include %</opt/ftam/include/mapftam.h>
Return_code
ft_rdata (connection_id, des_requested, return_event_name,
          inout_dcb)
Connection_id                          connection_id;
Uint16                                 des_requested;
Local_event_name                       return_event_name;
struct Ft_rdata_out_dcb                **inout_dcb;
```

Use ft_rdata() to receive the data you requested on ft_read(). Issuing ft_rdata() controls the number of data elements you read (i.e., controls the flow of information). You may have to call ft_rdata() several times to read the entire contents of a file. The information returns in the inout_dcb->data_unit parameter.

Since FTAM-1, FTAM-3, and INTAP-1 files contain only single FADUs, you must read the entire file. You can read individual FADUs within FTAM-2 files. (Refer to the “FTAM Data Structures” chapter for Ft_data_unit information.)

- Invoke ft_rdata() in the Data Transfer regime after invoking ft_read(); you do not move to another regime.
- The des_requested parameter specifies the maximum number of data elements you want to receive.
- During ft_connect(), you must negotiate the FT_FU_READ functional_units to use ft_rdata().
- If the inout_dcb->data_unit->structure_id equals FT_DATA_END, you reached the end of the file.
- If the inout_dcb->data_unit->structure_id equals FT_CANCEL_IND, the responder cancelled the data transfer. Call ft_rcancel() to respond to the cancel indication; do not send another ft_rdata().

Ft_rdata_out_dcb

```
struct  Ft_rdata_out_dcb {
     Uint16                    size;
     struct  Api_rc            result;
     Uint32                    des_received;
     struct  Ft_data_unit      *data_unit;
     enum    Ft_action_result  action_result;
     struct  Ft_diagnostic     *diagnostic;
};
```

ft_rdata() Parameters

ft_rdata() Parameter	Type	Description
connection_id	Mandatory Input	Uniquely identifies a specific connection to the filestore
des_requested	Mandatory Input	Maximum number of data elements you want to receive
return_event_name	Mandatory Input	If the call is asynchronous, uniquely identifies the function call; if the call is synchronous, the value is zero
inout_dcb->size	Mandatory input if using inout_dcb	Size (in Octets) of the inout_dcb structure and data
inout_dcb->result	Output	Pointer to the struct Api_rc containing the outcome of the operation: result_code and vendor_code (HP-UX—specific error)
inout_dcb-> des_received	Output	Number of data elements received by this request if it is successful
inout_dcb->data_unit	Output	Contains the returned data
inout_dcb-> action_result	Output	Specifies the overall success or failure of the request
inout_dcb->diagnostic	Output	Provides ISO-specific error information

ft_rdataqos()

```
#include %</opt/ftam/include/map.h>
#include %</opt/ftam/include/mapftam.h>
Return_code
ft_rdataqos (src_connection_id, dest_connection_id,
          des_requested, return_event_name, inout_dcb)
Connection_id                          src_connection_id;
Connection_id                          dest_connection_id;
Uint16                                 des_requested;
Local_event_name                       return_event_name;
struct Ft_rdata_out_dcb                **inout_dcb;
```

Use ft_rdataqos() to receive the data you requested on ft_read(). Issuing ft_rdataqos() controls the number of data elements you read (i.e., controls the flow of information). You may have to call ft_rdataqos() several times to read the entire contents of a file. The information returns in the inout_dcb->data_unit parameter.

Since FTAM-1, FTAM-3, and INTAP-1 files contain only single FADUs, you must read the entire file. You can read individual FADUs within FTAM-2 files. (Refer to the “FTAM Data Structures” chapter for Ft_data_unit information.)

- Both ft_rdataqos() and ft_rdata() perform the same function. However, ft_rdataqos() is used if QOS is set to 1 or 2 while ft_rdata() is used if QOS is set to 0. Also, in ft_rdataqos(), both the source and destination connection_ids are passed while in ft_rdata(), only one connection_id is passed.
- Invoke ft_rdataqos() in the Data Transfer regime after invoking ft_read(); you do not move to another regime.
- The des_requested parameter specifies the maximum number of data elements you want to receive.
- During ft_connect(), you must negotiate the FT_FU_READ functional_units to use ft_rdataqos().
- If the inout_dcb->data_unit->structure_id equals FT_DATA_END, you reached the end of the file.
- If the inout_dcb->data_unit->structure_id equals FT_CANCEL_IND, the responder cancelled the data transfer. Call ft_rcancel() to respond to the cancel indication; do not send another ft_rdataqos().

Ft_rdataqos_out_dcb

```
struct  Ft_rdataqos_out_dcb {
     Uint16                     size;
     struct  Api_rc             result;
     Uint32                     des_received;
     struct  Ft_data_unit       *data_unit;
     enum    Ft_action_result   action_result;
     struct  Ft_diagnostic      *diagnostic;
};
```

ft_rdataqos() Parameters

ft_rdataqos() Parameter	Type	Description
src_connection_id	Mandatory Input	Uniquely identifies the source connection to the filestore
dest_connection_id	Mandatory Input	Uniquely identifies the destination connection to the filestore
des_requested	Mandatory Input	Maximum number of data elements you want to receive
return_event_name	Mandatory Input	If the call is asynchronous, uniquely identifies the function call; if the call is synchronous, the value is zero
inout_dcb->size	Mandatory input if using inout_dcb	Size (in Octets) of the inout_dcb structure and data
inout_dcb->result	Output	Pointer to the struct Api_rc containing the outcome of the operation: result_code and vendor_code (HP-UX—specific error)
inout_dcb-> des_received	Output	Number of data elements received by this request if it is successful
inout_dcb->data_unit	Output	Contains the returned data
inout_dcb-> action_result	Output	Specifies the overall success or failure of the request
inout_dcb->diagnostic	Output	Provides ISO-specific error information

Writing Data

Use ft_write() and ft_sdata() to write data.

- Use ft_write() to request permission to write information to a file and to specify what to write (from the initiator to the responder).
- Use ft_sdata() to send data.

ft_write()

```
#include %</opt/ftam/include/map.h>
#include %</opt/ftam/include/mapftam.h>
Return_code
ft_write (connection_id, fadu_identity, fadu_operation,
          return_event_name, input_dcb, inout_dcb)
Connection_id                          connection_id;
struct Ft_fadu_identity                fadu_identity;
enum Ft_fadu_operation                 fadu_operation;
Local_event_name                       return_event_name;
char                                   *input_dcb;
struct Ft_write_out_dcb                **inout_dcb;
```

Use ft_write() to write data to a specific filestore by identifying a FADU to which you want to write. You can only write to a file as follows.

FTAM-1, FTAM-3, and INTAP-1	FTAM-2
• To write over the existing FADU, fadu_identity.fadu_location must be FT_FIRST and fadu_operation must be FT_REPLACE. • To write to the end of the FADU, fadu_identity.fadu_location must be FT_FIRST and fadu_operation must be FT_EXTEND.	You can only write to the end of the file. The fadu_identity.fadu_location must be FT_END and fadu_operation must be FT_INSERT.

- Invoke ft_write() in the File Open regime to move to the Data Transfer regime.
- During ft_connect(), you must negotiate the FT_FU_WRITE functional_units to use ft_write().
- During ft_create() and ft_select(), you must set requested_access according to the document type.

FTAM-1, FTAM-3, and INTAP-1	FTAM-2
FT_FA_EXTEND FT_FA_REPLACE	FT_FA_INSERT

- During ft_open(), you must set processing_mode according to the document type.

FTAM-1 and FTAM-3	FTAM-2
FT_PM_EXTEND FT_PM_REPLACE	FT_PM_INSERT

- The ft_write() input_dcb parameter does not contain information; therefore, pass a NULL pointer for the input_dcb parameter.

Ft_write_out_dcb

```
struct    Ft_write_out_dcb {
        Uint32        size;
        struct        Api_rc    result;
};
```

ft_write() Parameters

ft_write() Parameter	Type	Description
connection_id	Mandatory Input	Uniquely identifies a specific connection to the filestore
fadu_identity	Mandatory Input	Identifies the FADU to which you write
fadu_operation	Mandatory Input	Specifies the action you are taking on a file; depends on the document type
return_event_name	Mandatory Input	If the call is asynchronous, uniquely identifies the function call; if the call is synchronous, the value is zero
input_dcb	Optional Input	Contains no information; pass a NULL pointer
inout_dcb->size	Mandatory input if using inout_dcb	Size (in Octets) of the inout_dcb structure and data
inout_dcb->result	Output	Pointer to the struct Api_rc containing the outcome of the operation: result_code and vendor_code (HP-UX—specific error)

ft_sdata()

```
#include %</opt/ftam/include/map.h>
#include %</opt/ftam/include/mapftam.h>
Return_code
ft_sdata (connection_id, data_unit, return_event_name,
          inout_dcb)
Connection_id                          connection_id;
struct Ft_data_unit                    *data_unit;
Local_event_name                       return_event_name;
struct Ft_sdata_out_dcb                **inout_dcb;
```

Use ft_sdata() to send data units to a file. You can send a maximum of 14 data units linked together for each ft_sdata() function call.

- Invoke ft_sdata() in the Data Transfer regime; you do not move to another regime.
- During ft_connect(), you must negotiate the FT_FU_WRITE functional_units to use ft_sdata().
- During ft_create() and ft_select(), you must set requested_access according to the document type.

FTAM-1, FTAM-3, and INTAP-1	FTAM-2
FT_FA_EXTEND FT_FA_REPLACE	FT_FA_INSERT

- If you call ft_sdata() asynchronously and then receive the FTE008_NO_CON_RESOURCES error, either call ft_nwcleared() to determine when the resources are free or re-issue ft_sdata().
- The total amount of data sent per ft_sdata() call is limited to about 7K octets. The function will return FTE101_BUFF_TOO_BIG if this threshold is exceeded.

Ft_sdata_out_dcb

```
struct  Ft_sdata_out_dcb {
     Uint32                    size;
     struct  Api_rc            result;
     enum    Ft_action_result  action_result;
     struct  Ft_diagnostic     *diagnostic;
};
```

ft_sdata() Parameters

ft_sdata() Parameter	Type	Description
connection_id	Mandatory Input	Uniquely identifies a specific connection to the filestore
data_unit	Mandatory Input	Linked list containing the data units to send; use data_unit to control the flow of data
return_event_name	Mandatory Input	If the call is asynchronous, uniquely identifies the function call; if the call is synchronous, the value is zero
inout_dcb->size	Mandatory input if using inout_dcb	Size (in Octets) of the inout_dcb structure and data
inout_dcb->result	Output	Pointer to the struct Api_rc containing the outcome of the operation: result_code and vendor_code (HP-UX—specific error)
inout_dcb-> action_result	Output	Specifies the overall success or failure of the request
inout_dcb->diagnostic	Output	Provides ISO-specific error information

Ending Data Transfer

Use ft_edata() and ft_etransfer() to terminate data transfers in an orderly manner. Use ft_cancel() to prematurely terminate a data transfer after issuing an ft_read() or ft_write() request, and use ft_rcancel() to respond to a cancel indication.

ft_edata()

```
#include %</opt/ftam/include/map.h>
#include %</opt/ftam/include/mapftam.h>
Return_code
ft_edata (connection_id, return_event_name, input_dcb,
          inout_dcb)
Connection_id                          connection_id;
Local_event_name                       return_event_name;
char                                   *input_dcb;
struct Ft_edata_out_dcb                **inout_dcb;
```

After issuing the necessary number of ft_sdata() functions, call ft_edata() to signal the responder you are no longer sending data (i.e., you completed sending the data unit).

You must call ft_edata() before calling ft_etransfer(); after calling ft_edata(), you can no longer call ft_sdata() until you call ft_etransfer() followed by ft_write().

- Invoke ft_edata() in the Data Transfer regime; you do not move to another regime.

Ft_edata_in_dcb

```
struct  Ft_edata_in_dcb {
     enum    Ft_action_result    action_result;
     struct  Ft_diagnostic       *diagnostic;
};
```

Ft_edata_out_dcb

```
struct  Ft_edata_out_dcb {
     Uint32                      size;
     struct  Api_rc              result;
     enum    Ft_action_result    action_result;
     struct  Ft_diagnostic       *diagnostic;
};
```

ft_edata() Parameters

ft_edata() Parameter	Type	Description
connection_id	Mandatory Input	Uniquely identifies a specific connection to the filestore
return_event_name	Mandatory Input	If the call is asynchronous, uniquely identifies the function call; if the call is synchronous, the value is zero
input_dcb->action_result	Mandatory Input	Specifies that all data was sent
input_dcb->diagnostic	Optional Input	ISO-specific error information; HP-UX responders accept, but ignore this value
inout_dcb->size	Mandatory input if using inout_dcb	Size (in Octets) of the inout_dcb structure and data
inout_dcb->result	Output	Pointer to the struct Api_rc containing the outcome of the operation: result_code and vendor_code (HP-UX—specific error)
inout_dcb->action_result	Output	Specifies the overall success or failure of the request
inout_dcb->diagnostic	Output	Provides ISO-specific error information

ft_etransfer()

```
#include %</opt/ftam/include/map.h>
#include %</opt/ftam/include/mapftam.h>
Return_code
ft_etransfer (connection_id, return_event_name, input_dcb,
              inout_dcb)
Connection_id                          connection_id;
Local_event_name                       return_event_name;
char                                   *input_dcb;
struct Ft_etransfer_out_dcb            **inout_dcb;
```

Use ft_etransfer() to end the transferring of data (ft_read() or ft_write()). Use ft_etransfer() in one of the following sequences.

ft_read() ft_rdata()	ft_write() ft_sdata() ft_edata()
ft_etransfer()	ft_etransfer()

- Invoking ft_etransfer() in the Data Transfer regime moves you back to the File Open regime.
- The ft_etransfer() input_dcb parameter does not contain information; therefore, pass a NULL pointer for the input_dcb parameter.

Ft_etransfer_out_dcb

```
struct  Ft_etransfer_out_dcb {
     Uint32                        size;
     struct  Api_rc                result;
     enum    Ft_action_result      action_result;
     struct  Ft_diagnostic         *diagnostic;
};
```

ft_etransfer() Parameters

ft_etransfer() Parameter	Type	Description
connection_id	Mandatory Input	Uniquely identifies a specific connection to the filestore
return_event_name	Mandatory Input	If the call is asynchronous, uniquely identifies the function call; if the call is synchronous, the value is zero
input_dcb	Optional Input	Contains no information; pass a NULL pointer
inout_dcb->size	Mandatory input if using inout_dcb	Size (in Octets) of the inout_dcb structure and data
inout_dcb->result	Output	Pointer to the struct Api_rc containing the outcome of the operation: result_code and vendor_code (HP-UX—specific error)
inout_dcb->action_result	Output	Specifies the overall success or failure of the request
inout_dcb->diagnostic	Output	Provides ISO-specific error information

ft_cancel()

```
#include %</opt/ftam/include/map.h>
#include %</opt/ftam/include/mapftam.h>
Return_code
ft_cancel (connection_id, return_event_name, input_dcb,
          inout_dcb)
Connection_id                       connection_id;
Local_event_name                    return_event_name;
struct Ft_cancel_in_dcb             *input_dcb;
struct Ft_cancel_out_dcb            **inout_dcb;
```

Use ft_cancel() to prematurely terminate the transferring of data. Using ft_cancel() does not abort the entire connection (as does ft_abort()). An example of using ft_cancel() could be when you are reading data from one FTAM file and writing to another, and you encounter an error when writing the data. You may want to cancel reading data from the FTAM file.

Call ft_cancel() after ft_read() or ft_write(), rather than calling ft_etransfer().

- If you are reading a file, you will not lose data. If you are writing to a file, you may or may not lose the data you wrote.
- Invoking ft_cancel() in the Data Transfer regime moves you back to the File Open regime.

Ft_cancel_in_dcb

```
struct  Ft_cancel_in_dcb {
     enum    Ft_action_result     action_result;
     struct  Ft_diagnostic        *diagnostic;
};
```

Ft_cancel_out_dcb

```
struct  Ft_cancel_out_dcb {
     Uint32                       size;
     struct  Api_rc               result;
     enum    Ft_action_result     action_result;
     struct   Ft_diagnostic        *diagnostic;
};
```

ft_cancel() Parameters

ft_cancel() Parameter	Type	Description
connection_id	Mandatory Input	Uniquely identifies a specific connection to the filestore
return_event_name	Mandatory Input	If the call is asynchronous, uniquely identifies the function call; if the call is synchronous, the value is 0 (zero)
input_dcb->action_result	Mandatory Input	Indicates failure of the data transfer; must be set to FT_AR_PERMANENT_ERROR
input_dcb->diagnostic	Optional Input	ISO-specific error information; HP-UX responders accept, but ignore, this value
inout_dcb->size	Mandatory input if using inout_dcb	Size (in Octets) of the inout_dcb structure and data
inout_dcb->result	Output	Pointer to the struct Api_rc containing the outcome of the operation: result_code and vendor_code (HP-UX—specific error)
inout_dcb->action_result	Output	Specifies the overall success or failure of the request
inout_dcb->diagnostic	Output	Provides ISO-specific error information

ft_rcancel()

```
#include %</opt/ftam/include/map.h>
#include %</opt/ftam/include/mapftam.h>
Return_code
ft_rcancel (connection_id, return_event_name, input_dcb,
            inout_dcb)
Connection_id                          connection_id;
Local_event_name                       return_event_name;
struct Ft_rcancel_in_dcb               *input_dcb;
struct Ft_rcancel_out_dcb              **inout_dcb;
```

If an error occurs during a data transfer, the responder sends you a cancel indication. To acknowledge you received this indication, call ft_rcancel(). A cancel indication returns either as an

- inout_dcb->result.return_code of FTE175_FCANCEL_IN_RECEIVED on ft_sdata() or
- as an inout_dcb->data_unit.structure_id of FT_CANCEL_IND on ft_rdata().

If you do not send ft_rcancel(), you receive a protocol error which results in an abort.

- Invoking ft_rcancel() in the Data Transfer regime moves you back to the File Open regime.

Ft_rcancel_in_dcb

```
struct  Ft_rcancel_in_dcb {
     enum    Ft_action_result     action_result;
     struct  Ft_diagnostic        *diagnostic;
};
```

Ft_rcancel_out_dcb

```
struct  Ft_rcancel_out_dcb {
        Uint32           size;
        struct  Api_rc   result;
};
```

ft_rcancel() Parameters

ft_rcancel() Parameter	Type	Description
connection_id	Mandatory Input	Uniquely identifies a specific connection to the filestore
return_event_name	Mandatory Input	If the call is asynchronous, uniquely identifies the function call; if the call is synchronous, the value is zero
input_dcb-> action_result	Mandatory Input	Indicates failure of the data transfer; set to the action_result received from the cancel indication
input_dcb->diagnostic	Optional Input	ISO-specific error information; set to the diagnostic received from the cancel indication
inout_dcb->size	Mandatory input if using inout_dcb	Size (in Octets) of the inout_dcb structure and data
inout_dcb->result	Output	Pointer to the struct Api_rc containing the outcome of the operation: result_code and vendor_code (HP-UX—specific error)

9 Handling Errors

Before writing programs to detect errors, you should be familiar with the following concepts. (Refer to the “HP-UX FTAM Overview” and “Using FTAM” chapters for descriptions of these concepts.)

- Synchronous and Asynchronous calls
- Context Free and Context Sensitive calls
- High and Low level services (HLS and LLS)

You should also understand the various failure types and the differences in errors occurring on synchronous versus asynchronous calls. This chapter covers both of these topics.

Chapter Overview

This chapter first describes general troubleshooting procedures for FTAM. The remaining sections explain the actions listed in these general guidelines. The specific topics are as follows.

- General Approach to Troubleshooting FTAM
- Interpreting Errors
  - Function Return Values
  - Output Errors
  - MAP 3.0 FTAM Errors
  - HP-UX-specific Errors
  - FTAM Protocol Machine (FPM) and Virtual Filestore (VFS) Errors
    - action_result
    - state_result
    - diagnostic
- Example Program Checking for Errors
- Logging Errors
- Using API Tracing

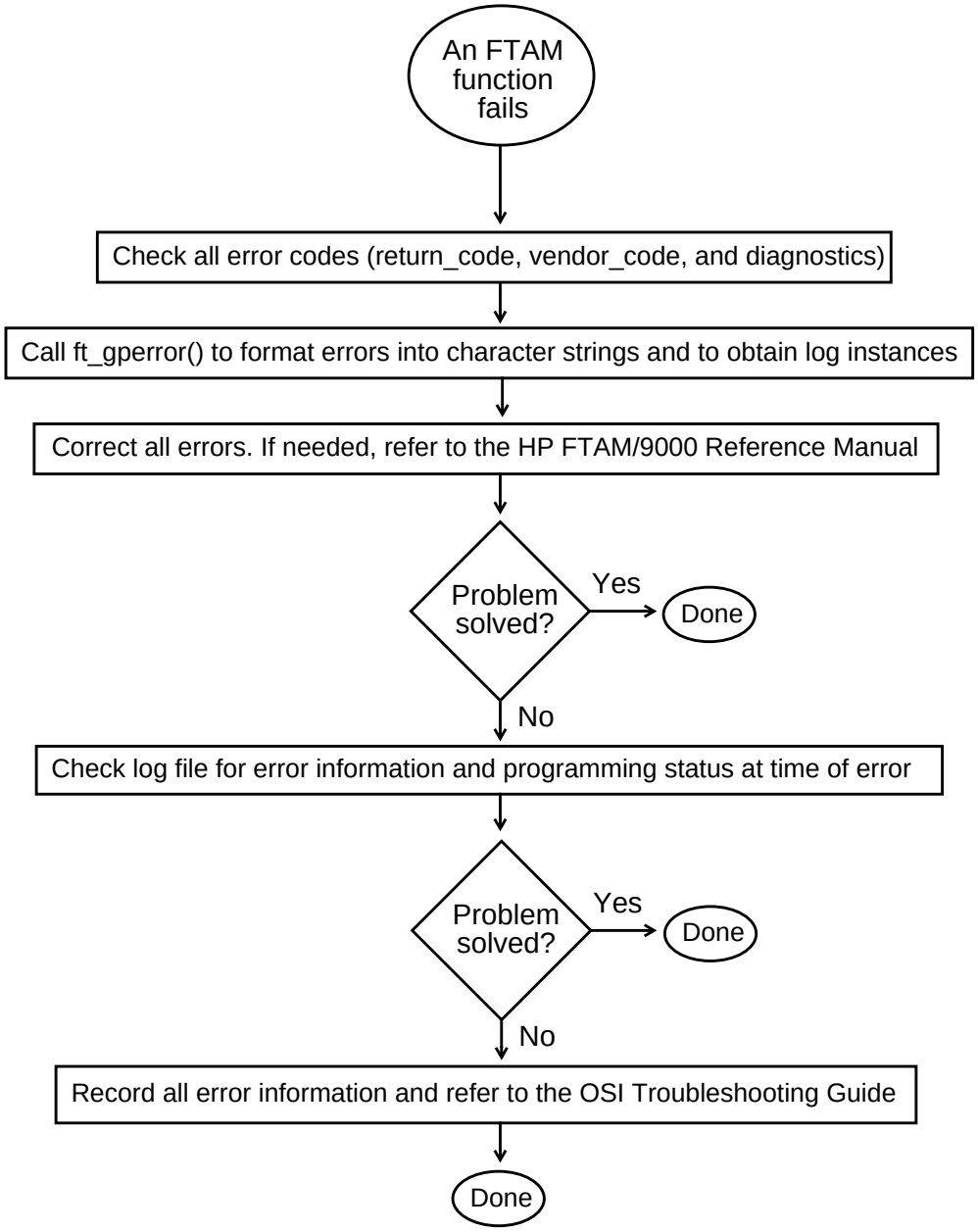
NOTE Refer to the *HP FTAM/9000 Reference Manual* for lists of errors, their probable causes, and possible recovery actions.

General Approach to Troubleshooting FTAM

To write a supportable program, you must check for errors. If you receive an error, use the following guidelines and Figure 9-1 to help you resolve the problem.

1. Check all error codes (return_codes, vendor_codes, diagnostics). The "Interpreting Errors" section describes the values you interpret.
2. Use ft_gperror() to format errors into printable character strings and to obtain log instances.
3. Correct the errors as indicated by these values. If needed, look up the error code in the *HP FTAM/9000 Reference Manual* to determine probable causes and corrective actions.
4. If the error still occurs, check the log file (described in the "Logging Errors" section) for error information, such as error codes, program status, and log instance. If you do not have a log instance, find the logged error by searching on the error string in the log file and by searching on the relative time when the error occurred.
5. If the error still occurs, record the following error information and refer to the OSI Planning and Troubleshooting Guide for corrective actions.
   - Specific function call that failed
   - Input parameters passed to the function
   - Function return value
   - inout_dcb->result.return_code
   - inout_dcb->result.vendor_code
   - inout_dcb->diagnostic
   - return_string returned by ft_gperror()
   - vendor_string returned by ft_gperror()
   - Log instance (upper 16 bits of the vendor_code)

Figure 9-1 General Approach to Troubleshooting FTAM



Interpreting Errors

Your program detects errors in two locations.

- Function Return Values (includes Event Management (EM) values)
- Output parameters

Function Return Values

Function return values indicate whether an error occurred.

- Function return values return in the program as integers.
- These values may occur because of errors on previous calls. For example, if the first call within a group fails, thereafter every function within the group fails.
- The value zero indicates SUCCESS.

Refer to the *HP FTAM/9000 Reference Manual* for a list of function return values.

Synchronous Calls	• If the value is SUCCESS, the request successfully passed to the application interface, ftam_init, and responder, and returned back to the user program. • If the value indicates an error, the application interface, ftam_init, or responder detected the error.
Asynchronous Calls	• If the value is SUCCESS, the request successfully passed from the application interface to ftam_init. • If the value indicates an error, the application interface detected the error.

Output Errors

Information returned in the inout_dcb fields may be defined by MAP 3.0 FTAM, HP-UX FTAM, FTAM Protocol Machine (FPM), or the VFS.

This Error	Returns As
MAP 3.0 FTAM error	result.return_code
HP-UX FTAM specific error	result.vendor_code
FPM or VFS error	action_result state_result diagnostic

MAP 3.0 FTAM Errors

Errors detected by the interface, an ftam_init, or an FTAM responder are mapped to MAP 3.0 FTAM errors and returned to the user program.

- The inout_dcb->result.return_code contains the MAP 3.0 FTAM error.
- To receive a printable character string and a log instance, call ft_gperror().

Refer to the *HP FTAM/9000 Reference Manual* for a list of MAP 3.0 FTAM errors and possible corrective actions.

Synchronous Calls	• The MAP 3.0 FTAM result.return_code is always the same as the function return value. • If result.return_code is SUCCESS, the request successfully passed to the application interface, ftam_init, and responder, and returned back to the user program.
Asynchronous Calls	• If result.return_code indicates an error, the application interface, ftam_init, or responder detected the error. • The em_wait() function returns a value for a specific event. If an error occurs in ftam_init or the responder, the function return value of em_wait() indicates SUCCESS and the result.return_code of the original function identifies the error. • The inout_dcb pointer and structure are not valid until the em_wait() request returns successfully. If you do not call em_wait(), you will not know if the request completed.

HP-UX-Specific Errors

Errors detected by the interface, an ftam_init, or an FTAM responder may contain HP-UX FTAM implementation-specific error information that is returned to the user program. The vendor_code contains both HP-UX—specific error information (lower 16 bits) and the log instance (upper 16 bits).

- The inout_dcb->result.vendor_code contains the vendor errors; however, not all errors returning in inout_dcb->result have an accompanying vendor_code.
- To receive a printable character string and a log instance, call ft_gperror().
- The vendor_code frequently provides additional information when errors return on HLCF functions.

Many vendor_codes indicate internal errors that require HP support assistance. Refer first, however, to the *HP FTAM/9000 Reference Manual* for a list of HP-UX—specific errors and possible corrective actions.

FPM and VFS Errors

FPM errors are generated in the FTAM protocol machine and VFS errors are generated in the Virtual Filestore. Both FPM or VFS errors return an action_result, and may optionally return a state_result or diagnostic.

action_result. The action_result reflects the overall success or failure of the request and returns as either FT_AR_SUCCESS or FT_AR_PERMANENT_ERROR, respectfully.

```
enum  Ft_action_result {
      FT_AR_SUCCESS=0,
      FT_AR_TRANSIENT_ERROR=1,
      FT_AR_PERMANENT_ERROR=2
};
```

state_result. The state_result indicates whether the FPM made the regime change and returns as either FT_SR_SUCCESS or FT_SR_FAILURE.

```
enum  Ft_state_result {
      FT_SR_SUCCESS=0,
      FT_SR_FAILURE=1
};
```

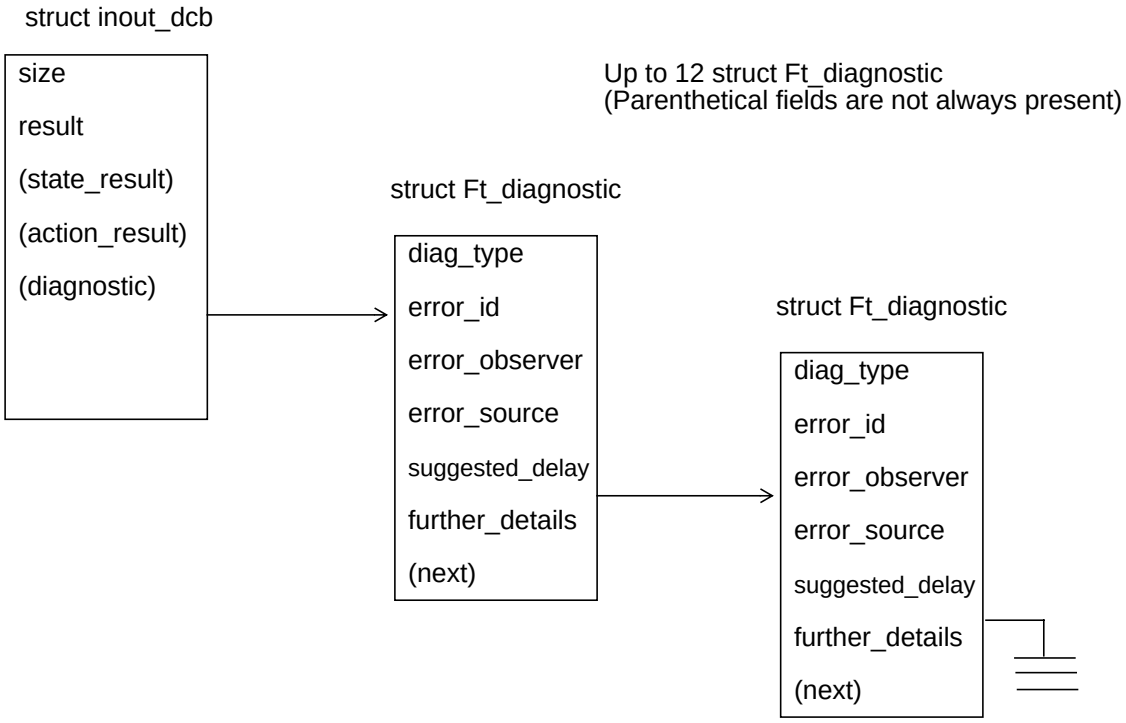
diagnostic. The diagnostic reflects the information defined by ISO/IS 8571. The diagnostic may be informational only or it may be error information that elaborates on the action_result. (Refer to Figure 9-2.)

- The diagnostic->error_id is the error identifier that returns in the Ft_diagnostic structure.
- For a character string describing the error, check the diagnostic->further_details field for additional information.
- Multiple ISO errors may be represented by a single MAP error; more than one diagnostic may return.
- Multiple FPM errors may occur on one call and are represented by a linked list of inout_dcb->diagnostic structures.

Refer to the *HP FTAM/9000 Reference Manual* for a list of diagnostic->error_ids.

```
struct Ft_diagnostic {
             struct  Ft_diagnostic       *next;
             enum  Ft_diag_type          diag_type;
             Uint16                      error_id;
             enum  Ft_entity_ref         error_observer;
             enum  Ft_entity_ref         error_source;
             Uint16                      suggested_delay;
             char                        *further_details;
};
```

Figure 9-2 inout_dcb->diagnostic



diagnostic Field	Description
next	Pointer to another Ft_diagnostic structure or NULL to indicate end of linked list; refer to mapftam.h.
diag_type	A description of the error type; refer to mapftam.h. HP-UX responders do not return the FT_TRANSIENT value.

```
enum   FT_diag_type {
       FT_INFORMATIVE      =  0,
       FT_TRANSIENT        =  1,
       FT_PERMANENT        =  2
};
```

error_id	The actual error as defined by ISO/IS 8571. Refer to the *HP FTAM/9000 Reference Manual* for a list of the error_ids, causes, and corrective actions.
error_observer	The entity that detects the error; refer to mapftam.h.

```
enum  FT_entity_ref {
      FT_NOT_CATEGORIZED                          =  0,
      FT_INITIATING_FILE_SERVICE_USER             =  1,
      FT_INITIATING_FILE_PROTOCOL_MACHINE         =  2,
      FT_SERVICE_SUPPORTING_FILE_PROTOCOL_MACHINE  =  3,
      FT_RESPONDING_FILE_PROTOCOL_MACHINE         =  4,
      FT_RESPONDING_FILE_SERVICE_USER             =  5
};
```

diagnostic Field	Description
error_source	Where the error is perceived to have originated.

```
enum  Ft_entity_ref {
      FT_NOT_CATEGORIZED                          =  0,
      FT_INITIATING_FILE_SERVICE_USER             =  1,
      FT_INITIATING_FILE_PROTOCOL_MACHINE         =  2,
      FT_SERVICE_SUPPORTING_FILE_PROTOCOL_MACHINE  =  3,
      FT_RESPONDING_FILE_PROTOCOL_MACHINE         =  4,
      FT_RESPONDING_FILE_SERVICE_USER             =  5
};
```

suggested_delay	Recommended delay before calling the function again; useful only for transient errors. HP-UX responders do not return suggested_delay information.
further_details	Additional information that may help you better understand the diagnostic->error_id; refer to mapftam.h.

Example Program Checking for Errors

This example checks the result.return_code, result.vendor_code, and Ft_diagnostic structures. This example also uses printf() statements to print the results.

```
#include %</opt/ftam/include/map.h>
#include %</opt/ftam/include/mapftam.h>
#include %<stdio.h>
/*
**                            error_handler
**
**   DESCRIPTION:
**     This routine is an example of handling failures experienced
**     during the FTAM functions. This routine will display the
**     error messages.
**
**  PARAMETERS:
**    INPUT:
**      result :              the MAP and HP error information
**      diag :                the ISO error information
**
*/
void
error_handler(result, diag)
Api_rc                          result;
struct Ft_diagnostic            *diag;
{
Return_code                     res;
Api_rc                          outcome;
Octet                           *return_string;
Octet                           *vendor_string;
struct Ft_diagnostic            *ft_diag = NULL;
        /*
        **   Initialize variables.
        */
        return_string = NULL;
        vendor_string = NULL;
```

```
        /*
        **   Call ft_gperror to get the printable strings for
        **   the return_code and vendor_code. Print the
        **   strings returned from ft_gperror.
        */
        res = ft_gperror(& result, & return_string, & vendor_string, &
outcome);
        if (res == SUCCESS) {
           if (return_string != NULL) {
              (void)printf("FTAM failure: return_code = %s\n", return_string);
              res = ft_fdmemory(return_string, & outcome);
              if (res != SUCCESS)
                 error_handler(outcome, ft_diag);
           }
           /*
           **   Print the vendor_code if it exists.
           */
           if (vendor_string != NULL) {
           (void)printf("FTAM failure: vendor_code = %s\n", vendor_string);
              res = ft_fdmemory(vendor_string, & outcome);
              if (res != SUCCESS)
                 error_handler(outcome, ft_diag);
           }
        }
        /*
        **   Traverse the diagnostic list and print the further_details
strings.
        */
        while(diag != NULL) {
            (void)printf("FTAM failure: diagnostic number = %d\n",
                         diag->error_id);
            if(diag->further_details != NULL)
                (void)printf("FTAM failure: diagnostic = %s\n",
                             diag->further_details);
            diag = diag->next;
        }
        exit(1);
}
```

Logging Errors

All errors return both in your programs and in the log files. When any of the OSI layers have an error, the error propagates up the stack, creating an error at each layer. The number that identifies the error is called a log instance. For example, if an error occurs at the Presentation layer, a related error also occurs at the Application layer. The same log instance occurs at least twice, identifying the related errors at both layers.

If you are unable to resolve errors returned in the user program, refer to the log file for additional error information, such as program status. This information may help you resolve the error or you may use it when calling an HP support representative or referencing the OSI Planning and Troubleshooting Guide.

Log classes include DISASTER, ERROR, WARNING, and INFORMATIVE cases.

Example Program Containing Error Information

Given a vendor_code, the following example creates a log filter file (/tmp/input_file) that the troubleshooting tool osidump uses to check for errors (via log instances in the log file). The file created records a time period (during which the error is assumed to have occurred), the log class to filter on, and the log instance. Following the program is sample output.

```
/* This routine creates a input FORMAT file for use by the “osidump”
*  command. The FORMAT file is created with two time lines, time_from
*  and time_to. A log class of ERROR is used to search on, and if a
*  log instance is present (upper 16 bits of the vendor code), then
*  the instance will also be added to the filter file.
*/
search_log(vcode)
int vcode;
{
FILE  *fp, *fopen();
long   now, time();
int     log_instance;
struct  tm *localtime();
struct  tm *clock;
extern  long timezone;
        /* open a /tmp file to store the FORMAT data */
        if ((fp = fopen(“/tmp/input_file”, “w”)) == NULL) {
                fprintf(stderr, “fopen error\n”);
                exit(1);
        }
        /* get current time */
        now = time ((long *) 0);
        clock = localtime(& now);
        /* get the upper 16 bits of the vendor_code */
        log_instance = vcode >> 16;
        /* write log filter file */
        fprintf(fp, “FORMATTER\tfilter\ttime_from\t”);
        if (clock->tm_min > 2)
                fprintf(fp, “%d:%02d:%02d\t”, clock->tm_hour,
                clock->tm_min - 3, clock->tm_sec);
        else
                fprintf(fp, “%d:%02d:%02d\t”, (clock->tm_hour + 23)%24,
                (clock->tm_min + 57)%60, clock->tm_sec);
```

```
        fprintf(fp, "%d/%d/%d\n", clock->tm_mon+1,
                clock->tm_mday, clock->tm_year);
        fprintf(fp, "FORMATTER\tfilter\ttime_to \t");
        fprintf(fp, "%d:%02d:%02d\t", clock->tm_hour,
                clock->tm_min, clock->tm_sec);
        fprintf(fp, "%d/%d/%d\n", clock->tm_mon+1,
                clock->tm_mday, clock->tm_year);
        /* set filter "class" to ERROR */
        fprintf(fp, "FORMATTER\tfilter\tclass        \tERROR\n");
        if (log_instance) /* log instance present */
                fprintf(fp, "FORMATTER\tfilter\tlog_instance\t%d\n",
                        log_instance);
        fclose(fp);
        /* Run osidump with the input FORMAT file just created */
        system("osidump -c /tmp/input_file > /tmp/log_file");
}
```

The following text is an example of what you might find in /tmp/input_file.

```
FORMATTER       filter  time_from       14:02:16        4/13/89
FORMATTER       filter  time_to         14:05:16        4/13/89
FORMATTER       filter  class           ERROR
FORMATTER       filter  log_instance     9284
```

Using API Tracing

API tracing allows you to get detailed information about your program's interactions with the HP FTAM API without your having to access your source code. It provides the return value of each API call made by your program as well as the input parameters to each call.

API Tracing Variables

HP FTAM API tracing is controlled by the following three global variables.

- ft_trace indicates the trace level to be used. The default value of ft_trace is 0, which indicates no tracing, but the value may instead be defined in the %<api_trace.h> file as either of the following:
  - API_TR_ENTRY_EXIT — procedure entry and exit are traced. No parameter information is displayed. This is useful if you are interested only in seeing what FTAM calls your program is making. This value is defined as 0x1.
  - API_TR_INPUT — input parameters to the FTAM functions, as well as procedure entry and exit, are traced. This is useful is you want to verify that FTAM is actually receiving the values you expect. This value is defined as 0x2.
- ft_trace_fp is a file pointer that is used to write the trace records. The default is stderr. You can redirect the trace information to be saved to a specific file, and then use fopen to open the file.
- ft_trace_max_udata indicates the maximum amount of user data (in bytes) to be displayed during tracing. The default is 16.

Enabling API Tracing

The following steps show how to enable API tracing in your program.

1. To include the appropriate definitions, add lines similar to the following to your program:

```
#include %<api_trace.h>
extern int ft_trace;
extern FILE *ft_trace_fp;
extern int ft_trace_max_udata
```

2. Within your program, enable tracing by changing the value of the ft_trace variable from 0 to either API_TR_ENTRY_EXIT or API_TR_INPUT. (The “Resolving FTAM Problems” chapter in the *HP FTAM/9000 User's Guide* provides information on enabling and disabling API tracing during an interactive FTAM session.)
3. If you want the trace output to be written to a file, redirect the trace output from stderr as follows.

   ```
   ft_trace_fp = fopen(“/tmp/my_ft_trace”,“a”);
   ```

4. If you want more than the first 16 bytes of data to be displayed, increase the value of the ft_trace_max_udata variable. For example:

   ```
   ft_trace_max_udata = 256
   ```

5. If you want API tracing to be a runtime option, use the -t option shown in the following sample code, and enter program_name -t at runtime.

The following example shows how to use the variables.

```
#include %<api_trace.h>
extern int ft_trace;
extern FILE *ft_trace_fp;
extern int ft_trace_max_udata;
..

main (argc,argv)
Int argc;
char **argv;
{
/* To run, enter “program name -t” to enable tracing*/
/* Check if tracing needs to be turned on */

if ((argc ==2) & &  (strcmp(argv{1}, “-t”) == 0))
{
/* Turn tracing on, create trace file */

ft_trace = API_TR_INPUT;
ft_trace_fp = fopen(“/tmp/my_trace_file”, “a”);
ft_trace_max_udata = 256

else
ft_trace = 0 /*To be safe, always initialize it*/

/*Then do whatever you have to do*/
}
```

Interpreting the Trace File

Every time a routine is entered and exited, the time (in hh:mm:ss format) and the name of the call are shown. First the -> arrow indicates the beginning of the call, then the input parameters are shown, and then the %<- arrow indicates the exit. The number following the %<- arrow is

the integer value of the return code for that call. A value of 0 indicates that there were no errors. If an integer other than 0 is returned, refer to the /opt/ftam/includei/mapftam.h file to determine which return code corresponds to the integer, and then refer to the “FTAM return_codes” chapter of the *HP FTAM/9000 Reference Manual* for the cause of the return code and corrective actions you can take.

The following is an example trace file for an HP FTAM session.

```
Tue Sep 1 08:55:14 1992 ->ft_aeactivation()
   my_ae_name = 0x5a718
   return_event_name = 0
   input_dcb->authentication = NULL
   input_dcb->my ae_title_option = User_object_id_option
   input_dcb->my ae_title = 0x5a908
Tue Sep 1 08:55:15 1992 %<-ft_aeactivation() = 0
Tue Sep 1 08:55:15 1992 ->ft_connect()
   ae_label = 0x202c0006
   return_even_name = 0
   called_ae_name = 0x5a9bc
   input_dcb->called_presentation_address = 0x0
   input_dcb->called_ae_title_option = User_object_id_option
   input_dcb->called_ae_title = 0x5ac14
   input_dcb->called_ae_invoke_id = 0x80000000
   input_dcb->called_ap_invoke_id = 0x80000000
   input_dcb->number_of_retry = 0
   input_dcb->delay_between_retry = 0
   input_dcb->connection_resource_wait_timer = 0
   input_dcb->context_name = 1 0 8571 1 1
   input_dcb->connect_in_info.service_class:
     FT_SC_TRANSFER
     FT_SC_TRANSFER_AND_MGMT
   input_dcb->connect_in_info.functional_units:
     FT_FU_READ
     FT_FU_WRITE
   input_dcb->connect_in_info.attribute_groups
     FT_AG_STORAGE
     FT_AG_PRIVATE
   input_dcb->connect_in_info.quality_of_service = FT_NO_RECOVERY
   input_dcb->connect_in_info.contents_type_list: 0x5ac74
   input_dcb->connect_in_info.contents_type_list.contents_type.connects_form =
     FT_DOCUMENT_TYPE
   contents_type->contents_info.document.name.length = 5
   contents_type->contents_info.document.name.element: 1 0 8571 5 3
   input_dcb->connect_in_info.initiator_identity = “root”
   input_dcb->connect_in_info.account = “account”
   input_dcb->connect_in_info.file_store_pw = “ftam”
Tue Sep 1 08:55:17 1992 %<-ft_connect() = 0
```

```
Tue Sep 1 08:55:18 1992 ->ft_open()
   connection_id = 65535
   processing_mode:
     FT_PM_READ
     FT_PM_REPLACE
     FT_PM_EXTEND
     FT_PM_ERASE
   contents_type->contents_info.document.name.length = 5
   contents_type->contents_info.document.name.element: 1 0 8571 5 3
   return_event_name = 0
   input_dcb->concurrency_control = NULL
Tue Sep 1 08:55:18 1992 %<-ft_open() = 0
Tue Sep 1 08:55:18 1992 ->ft_read()
   connection_id = 65536
   fadu_identity->fadu_form = FT_FADU_LOCATION
   fadu_identity->fadu_info.fadu_location = FT_FIRST
   access_context = UNSTRUCTURED_ALL_DATA_UNITS
   return_event_name = 0
Tue Sep 1 08:55:18 1992 %<-ft_read() = 0
Tue Sep 1 08:55:19 1992 ->ft_close()
   connection_id = 65535
   return_event_name = 2
Tue Sep 1 08:55:19 1992 %<-ft_close() = 0
```

10 Example Programs

Former Introduction ... need to change

You can learn from the code examples in this chapter, and pattern your applications after them. The examples are in the following order.

Using HLCF Functions Example	This routine synchronously calls the HLCF functions ft_fcopy(), ft_fcattributes(), and ft_fdelete(). Additionally, the routine uses ft_dfdcb() to free dynamically allocated data control blocks (DCBs).
Managing FTAM Connections Example	This routine activates ftam_init and synchronously establishes a connection to a responder. The routine then releases the connection and deactivates the ftam_init.
Using LLCS Functions Example	This routine transfers a source file to a destination directory using LLCS functions.
Setting Ae_dir_dn and P_address Utility Example	This routine sets the directory distinguished name and presentation address for the first three examples.
Checking for Errors Example	This routine checks the function return value, result.return_code, result.vendor_code, and diagnostic for the first three examples.
Common Code Example	This routine contains global definitions and common code used by the first three examples.

NOTE

For an on-line copy of the example that sets the Ae_dir_name and P_address, refer to /opt/osi/lib/demos. For on-line copies of all the other examples, refer to /opt/ftam/demos. (See the README files in both directories.)

Additionally, you can refer to the on-line file /opt/ftam/demos/makefile for an example Makefile used to compile the example programs.

Using HLCF Functions Example

This example program synchronously calls the high level context free functions ft_fcopy(), ft_fcattributes(), ft_fdelete(). Additionally, the program uses ft_dfdcb() to free dynamic memory. Refer to the following three sections for associated routines: “Setting Ae_dir_name and P address Utility Example,” “Checking for Errors Example,” and “Common Code Example.”

```
#include %</opt/ftam/include/map.h>
#include %</opt/ftam/include/mapftam.h>
#include “ftm_globs.h”
#include %<stdio.h>
main()
/*
**                                  ftm_hlcopy
**
**   DESCRIPTION:
**     This example program uses high level, context free functions
**     synchronously. This program copies a file, changes the
**     attributes of the destination file and deletes the source file.
*/
{
Ae_label                          ae_label;
Ae_dir_name                       source_dirname;
Ft_filename                       source_filename;
Ae_dir_name                       destination_dirname;
Ft_filename                       destination_filename;
Local_event_name                  return_event_name;
struct Ft_fcopy_in_dcb            *fco_input_dcb;
struct Ft_fcopy_out_dcb           *fco_inout_dcb;
struct Ft_fcattributes_in_dcb     *fca_input_dcb;
struct Ft_fcattributes_out_dcb    *fca_inout_dcb;
struct Ft_fdelete_in_dcb          *fde_input_dcb;
struct Ft_fdelete_out_dcb         *fde_inout_dcb;
Return_code                       res;
Api_rc                            outcome;
struct Ft_diagnostic              *diag = NULL;
     (void)printf(“ftm_fcopy: starting\n”);
     /*
     **   Copy the source file to the destination directory.
     **
     **   Get the parameters for ft_fcopy.
     **   Call ft_fcopy and verify the outcome.
     */
     (void)printf(“Copying the source file to the destination directory...\n”);
     fco_parm_in( & source_dirname, & source_filename,
                  & destination_dirname, & destination_filename,
                  & ae_label, & return_event_name, & fco_input_dcb,
                  & fco_inout_dcb );
     res = ft_fcopy(source_dirname, source_filename, destination_dirname,
                     destination_filename, & ae_label,
                     return_event_name, fco_input_dcb, & fco_inout_dcb);
     if (res != SUCCESS)
        error_handler(fco_inout_dcb->result, fco_inout_dcb->diagnostic);
```

```
        /*
        **   Free memory.
        */
        res = ft_dfdcb((Octet *)fco_input_dcb, & outcome);
        if (res != SUCCESS)
           error_handler(outcome, diag);
        res = ft_dfdcb((Octet *)fco_inout_dcb, & outcome);
        if (res != SUCCESS)
           error_handler(outcome, diag);
        /*
        **   Change the attributes of the destination file.
        **
        **   Get the parameters for ft_fcattributes.
        **   Call ft_fcattributes and verify the outcome.
        */
        (void)printf("Changing attributes of the destination file...\n");
        fca_parm_in( & destination_dirname, & destination_filename,
                     & ae_label, & return_event_name, & fca_input_dcb,
                     & fca_inout_dcb );
        res = ft_fcattributes(destination_dirname, destination_filename,
                              & ae_label, return_event_name, fca_input_dcb,
                              & fca_inout_dcb);
        if (res != SUCCESS)
           error_handler(fca_inout_dcb->result, fca_inout_dcb->diagnostic);
        /*
        **   Free memory.
        */
        res = ft_dfdcb((Octet *)fca_input_dcb, & outcome);
        if (res != SUCCESS)
           error_handler(outcome, diag);
        res = ft_dfdcb((Octet *)fca_inout_dcb, & outcome);
        if (res != SUCCESS)
           error_handler(outcome, diag);
        /*
        **   Delete the source file.
        **
        **   Get the parameters for ft_fdelete.
        **   Call ft_fdelete and verify the outcome.
        */
        (void)printf("Deleting the source file...\n");
        fde_parm_in( & source_dirname, & source_filename,
                     & ae_label, & return_event_name, & fde_input_dcb,
                     & fde_inout_dcb );
        res = ft_fdelete(source_dirname, source_filename, & ae_label,
                         return_event_name, fde_input_dcb, & fde_inout_dcb);
        if (res != SUCCESS)
           error_handler(fde_inout_dcb->result, fde_inout_dcb->diagnostic);
        /*
        **   Free memory.
        */
        res = ft_dfdcb((Octet *)fde_input_dcb, & outcome);
        if (res != SUCCESS)
           error_handler(outcome, diag);
        res = ft_dfdcb((Octet *)fde_inout_dcb, & outcome);
        if (res != SUCCESS)
           error_handler(outcome, diag);
        (void)printf("ftm_hlcopy: finished\n");
        return(SUCCESS);
}
```

Managing FTAM Connections Example

This example uses the ft_aeactivation(), ft_connect(), ft_rrequest(), ft_aedeactivation(), and ft_dfdcb() functions. Refer to the following sections for associated routines: “Setting Ae_dir_dn and P_address Utility Example,” “Checking for Errors Example,” and “Common Code Example.”

```
#include %</opt/ftam/include/map.h>
#include %</opt/ftam/include/mapftam.h>
#include “ftm_globs.h”
#include %<stdio.h>
main()
/*
**                            ftm_connect
**
**   DESCRIPTION:
**     This example program illustrates how to establish
**     a connection with an active “ftam_init” synchronously.
**     This program also releases the connection and deactivates
**     “ftam_init”.
**
**
*/
{
Ae_label                     ae_label;
Connection_id                connection_id;
Ae_dir_name                  my_ae_name;
Ae_dir_name                  called_ae_name;
Local_event_name             return_event_name;
struct Ft_aeactivate_in_dcb  *aea_input_dcb;
struct Ft_connect_in_dcb     *con_input_dcb;
struct Ft_relreq_in_dcb      *rre_input_dcb;
struct Ft_output             *aea_inout_dcb;
struct Ft_connect_out_dcb    *con_inout_dcb;
struct Ft_relreq_out_dcb     *rre_inout_dcb;
struct Ft_output             *aed_inout_dcb;
Return_code                  res;
Api_rc                       outcome;
struct Ft_diagnostic         *diag = NULL;
     (void)printf(“ftm_connect: starting\n”);
```

```
/*
**   Activate “ftam_init”.
**
**   Get the parameters for ft_aeactivation.
**   Call ft_aeactivation and verify the outcome.
*/
(void)printf(“Activating ftam_init...\n”);
aea_parm_in( & my_ae_name, & return_event_name, & aea_input_dcb,
            & aea_inout_dcb, & ae_label );
res = ft_aeactivation(my_ae_name, return_event_name, aea_input_dcb,
                      & aea_inout_dcb, & ae_label);
if (res != SUCCESS)
   error_handler(aea_inout_dcb->result, diag);
/*
**   Free memory.
*/
res = ft_dfdcb((Octet *)aea_inout_dcb, & outcome);
if (res != SUCCESS)
   error_handler(outcome, diag);
/*
**   Establish a connection with the responder.
**
**   Get the parameters for ft_connect.
**   Call ft_connect and verify the outcome.
*/
(void)printf(“Establishing a connection with the responder...\n”);
con_parm_in( & return_event_name, & called_ae_name, & con_input_dcb,
            & con_inout_dcb, & connection_id );
res = ft_connect(ae_label, return_event_name, called_ae_name,
                 con_input_dcb, & con_inout_dcb, & connection_id);
if (res != SUCCESS)
   error_handler(con_inout_dcb->result,
                 con_inout_dcb->connect_out_info->diagnostic);
/*
**   Free memory.
*/
res = ft_dfdcb((Octet *)con_input_dcb, & outcome);
if (res != SUCCESS)
   error_handler(outcome, diag);
res = ft_dfdcb((Octet *)con_inout_dcb, & outcome);
if (res != SUCCESS)
   error_handler(outcome, diag);
/*
**   Release the connection with the responder.
**
**   Get the parameters for ft_rrequest.
**   Call ft_rrequest and verify the outcome.
*/
(void)printf(“Releasing the connection with the responder...\n”);
rre_parm_in( & return_event_name, & rre_input_dcb, & rre_inout_dcb );
res = ft_rrequest(connection_id, return_event_name, rre_input_dcb,
                  & rre_inout_dcb);
if (res != SUCCESS)
   error_handler(rre_inout_dcb->result, diag);
/*
**   Free memory.
*/
res = ft_dfdcb((Octet *)rre_inout_dcb, & outcome);
if (res != SUCCESS)
   error_handler(outcome, diag);
```

```
        /*
        **   Deactivate “ftam_init”.
        **
        **   Get the parameters for ft_aedeactivation.
        **   Call ft_aedeactivation and verify the outcome.
        */
        (void)printf(“Deactivating ftam_init...\n”);
        aed_parm_in( & return_event_name, & aed_inout_dcb );
        res = ft_aedeactivation(ae_label, return_event_name, & aed_inout_dcb);
        if (res != SUCCESS)
           error_handler(aed_inout_dcb->result, diag);
        /*
        **   Free memory.
        */
        res = ft_dfdcb((Octet *)aed_inout_dcb, & outcome);
        if (res != SUCCESS)
           error_handler(outcome, diag);
        (void)printf(“ftm_connect: finished\n”);
        return(SUCCESS);
    }
```

Using LLCS Functions Example

This example uses the following functions. Refer to the following sections for associated routines: “Setting Ae_dir_dn and P_address Utility Example,” “Checking for Errors Example,” and “Common Code Example.”

- em_wait()
- ft_aeactivation()
- ft_dfdcb()
- ft_connect()
- ft_open()
- ft_read()
- ft_write()
- ft_rdata()
- ft_sdata()
- ft_nwcleared()
- ft_edata()
- ft_etransfer()
- ft_bgroup()
  - ft_select()
  - ft_rattributes()
- ft_egroup()
- ft_bgroup()
  - ft_create()
  - ft_open()
- ft_egroup()
- ft_bgroup()
  - ft_close()
  - ft_deselect()
- ft_egroup()

```
#include %</opt/ftam/include/map.h>
#include %</opt/ftam/include/mapftam.h>
#include “ftm_globs.h”
#include %<stdio.h>
main()
/*
**                                ftm_llcopy
**
** DESCRIPTION:
**   This example program illustrates how to transfer a file
**   using low level, context sensitive FTAM functions. This
**   program transfers the source file to the destination directory.
**
*/
{
Ae_dir_name                   my_dirname;
Ae_dir_name                   dirname;
Ae_label                      ae_label;
Local_event_name              return_event_name;
Connection_id                 conn_id[TWO_CONNECTIONS];
Ft_filename                   src_filename;
Ft_filename                   dst_filename;
Ft_processing_mode            processing_mode;
Ft_file_actions               requested_access;
enum Ft_file_status           file_status;
enum Ft_access_context        access_context;
enum Ft_fadu_operation        fadu_operation;
struct Ft_fadu_identity       fadu_identity;
struct Ft_contents_type       contents_type;
Uint16                        threshold;
Uint16                        des_requested;
struct Ft_data_unit           *data_unit;
struct Ft_aeactivate_in_dcb   *aea_input_dcb;
struct Ft_output              *aea_inout_dcb;
struct Ft_connect_in_dcb      *con_input_dcb;
struct Ft_connect_out_dcb     *con_inout_dcb;
struct Ft_relreq_in_dcb       *rre_input_dcb;
struct Ft_relreq_out_dcb      *rre_inout_dcb;
struct Ft_output              *aed_inout_dcb;
char                          *bgr_input_dcb;
struct Ft_bgroup_out_dcb      *bgr_inout_dcb;
char                          *egr_input_dcb;
struct Ft_egroup_out_dcb      *egr_inout_dcb;
struct Ft_select_in_dcb       *sel_input_dcb;
struct Ft_select_out_dcb      *sel_inout_dcb;
struct Ft_create_in_dcb       *cre_input_dcb;
struct Ft_create_out_dcb      *cre_inout_dcb;
struct Ft_rattributes_in_dcb  *rat_input_dcb;
struct Ft_rattributes_out_dcb *rat_inout_dcb;
struct Ft_open_in_dcb         *ope_input_dcb;
struct Ft_open_out_dcb        *ope_inout_dcb;
char                          *rea_input_dcb;
struct Ft_read_out_dcb        *rea_inout_dcb;
char                          *wri_input_dcb;
struct Ft_write_out_dcb       *wri_inout_dcb;
struct Ft_rdata_out_dcb       *rda_inout_dcb;
struct Ft_sdata_out_dcb       *sda_inout_dcb;
struct Ft_edata_in_dcb        *eda_input_dcb;
struct Ft_edata_out_dcb       *eda_inout_dcb;
```

```
char                            *etr_input_dcb;
struct Ft_etransfer_out_dcb     *etr_inout_dcb;
struct Ft_nwcleared_out_dcb     *nwc_inout_dcb;
char                            *clo_input_dcb;
struct Ft_close_out_dcb         *clo_inout_dcb;
char                            *des_input_dcb;
struct Ft_deselect_out_dcb      *des_inout_dcb;
Em_t                            time;
Api_rc                          result;
struct Ft_attributes            attr_src;
Return_code                     res;
Api_rc                          outcome;
int                             i, j, index;
Bool                            done;
struct Ft_diagnostic            *diag = NULL;
(void)printf("ftm_llcopy: starting\n");
     /*
     **   Activate "ftam_init".
     **
     **   Get the parameters for ft_aeactivation.
     **   Call ft_aeactivation and verify the outcome.
     */
     (void)printf("Activating ftam_init...\n");
     aea_parm_in( & my_dirname, & return_event_name, & aea_input_dcb,
                  & aea_inout_dcb, & ae_label );
     res = ft_aeactivation(my_dirname, return_event_name, aea_input_dcb,
                           & aea_inout_dcb, & ae_label);
     if (res != SUCCESS)
        error_handler(aea_inout_dcb->result, diag);
     /*
     **   Free memory.
     */
     res = ft_dfdcb((Octet *)aea_inout_dcb, & outcome);
     if (res != SUCCESS)
        error_handler(outcome, diag);
     /*
     **   Establish connections between ftam_init and the responder
     **   for the source file and between ftam_init and the responder
     **   for the destination file.
     **
     **   Get the parameters for ft_connect.
     **   Call ft_connect and verify the outcome.
     */
     (void)printf("Establishing connections for the source");
     (void)printf(" &  destination files...\n");
         con_source_parm_in( & return_event_name, & dirname, & con_input_dcb,
                             & con_inout_dcb, & conn_id[0] );
         res = ft_connect(ae_label, return_event_name, dirname,
                          con_input_dcb, & con_inout_dcb, & conn_id[0]);
         if (res != SUCCESS)
            error_handler(con_inout_dcb->result,
                          con_inout_dcb->connect_out_info->diagnostic);
```

```
        /*
        **   Free memory.
        */
        res = ft_dfdcb((Octet *)con_input_dcb, & outcome);
        if (res != SUCCESS)
           error_handler(outcome, diag);
        res = ft_dfdcb((Octet *)con_inout_dcb, & outcome);
        if (res != SUCCESS)
           error_handler(outcome, diag);
        con_parm_in( & return_event_name, & dirname, & con_input_dcb,
                     & con_inout_dcb, & conn_id[1] );
        res = ft_connect(ae_label, return_event_name, dirname,
                         con_input_dcb, & con_inout_dcb, & conn_id[1]);
        if (res != SUCCESS)
           error_handler(con_inout_dcb->result,
                         con_inout_dcb->connect_out_info->diagnostic);
        /*
        **   Free memory.
        */
        res = ft_dfdcb((Octet *)con_input_dcb, & outcome);
        if (res != SUCCESS)
           error_handler(outcome, diag);
        res = ft_dfdcb((Octet *)con_inout_dcb, & outcome);
        if (res != SUCCESS)
           error_handler(outcome, diag);
    /*
    **   Perform a grouped activity on the source file.
    **   ft_bgroup
    **      ft_select
    **      ft_rattributes
    **   ft_egroup
    **
    **   Get the parameters for ft_bgroup.
    **   Call ft_bgroup and verify the outcome.
    */
    (void)printf("Selecting and reading attributes of the source file...\n");
    bgr_parm_in( & threshold, & return_event_name, & bgr_input_dcb,
                 & bgr_inout_dcb );
    res = ft_bgroup(conn_id[SRC], threshold, return_event_name,
                    bgr_input_dcb, & bgr_inout_dcb);
    if (res != SUCCESS)
       error_handler(bgr_inout_dcb->result, diag);
    /*
    **   Get the parameters for ft_select.
    **   Call ft_select and verify the outcome.
    */
    sel_parm_in( & src_filename, & requested_access,
                 & return_event_name, & sel_input_dcb, & sel_inout_dcb );
    res = ft_select(conn_id[SRC], src_filename, requested_access,
                    return_event_name, sel_input_dcb, & sel_inout_dcb);
    if (res != SUCCESS)
       error_handler(sel_inout_dcb->result, sel_inout_dcb->diagnostic);
    /*
    **   Get the parameters for ft_rattributes.
    **   Call ft_rattributes and verify the outcome.
    */
    rat_parm_in( & return_event_name, & rat_input_dcb, & rat_inout_dcb );
    res = ft_rattributes(conn_id[SRC], return_event_name, rat_input_dcb,
                         & rat_inout_dcb);
    if (res != SUCCESS)
       error_handler(rat_inout_dcb->result, rat_inout_dcb->diagnostic);
```

```
/*
**   Get the parameters for ft_egroup.
**   Call ft_egroup and verify the outcome.
*/
egr_parm_in( & return_event_name, & egr_input_dcb, & egr_inout_dcb );
res = ft_egroup(conn_id[SRC], return_event_name, egr_input_dcb,
                  & egr_inout_dcb);
if (res != SUCCESS)
   error_handler(egr_inout_dcb->result, diag);
/*
**   Wait on the asynchronous events in the group.
*/
for (i = 1; i %<M=> 3; ++i) {
  wait_parm_in( & time, & result );
  res = em_wait(time, & return_event_name, & result);
  if (res != SUCCESS)
     error_handler(result, diag);
  switch (return_event_name) {
    case 1:
      if (bgr_inout_dcb->result.return_code != SUCCESS)
         error_handler(bgr_inout_dcb->result, diag);
      break;
    case 2:
      if (sel_inout_dcb->result.return_code != SUCCESS)
         error_handler(sel_inout_dcb->result,
                       sel_inout_dcb->diagnostic);
      break;
    case 3:
      if (rat_inout_dcb->result.return_code != SUCCESS)
         error_handler(rat_inout_dcb->result,
                       rat_inout_dcb->diagnostic);
      break;
    default:
      break;
  }
}
/*
**   Save the attributes of the source file.
*/
attr_src = rat_inout_dcb->attributes;
/*
**   Free memory.
*/
res = ft_dfdcb((Octet *)bgr_inout_dcb, & outcome);
if (res != SUCCESS)
   error_handler(outcome, diag);
res = ft_dfdcb((Octet *)sel_input_dcb, & outcome);
if (res != SUCCESS)
   error_handler(outcome, diag);
res = ft_dfdcb((Octet *)sel_inout_dcb, & outcome);
if (res != SUCCESS)
   error_handler(outcome, diag);
res = ft_dfdcb((Octet *)egr_inout_dcb, & outcome);
if (res != SUCCESS)
   error_handler(outcome, diag);
```

```
/*
**   Open the source file.
**
**   Get the parameters for ft_open.
**   Call ft_open and verify the outcome.
*/
(void)printf("Opening the source file...\n");
ope_parm_in( & processing_mode, & contents_type,
             & return_event_name, & ope_input_dcb, & ope_inout_dcb);
res = ft_open(conn_id[SRC], processing_mode, contents_type,
                return_event_name, ope_input_dcb, & ope_inout_dcb);
if (res != SUCCESS)
   error_handler(ope_inout_dcb->result, ope_inout_dcb->diagnostic);
/*
**   Free memory.
*/
res = ft_dfdcb((Octet *)ope_input_dcb, & outcome);
if (res != SUCCESS)
   error_handler(outcome, diag);
res = ft_dfdcb((Octet *)ope_inout_dcb, & outcome);
if (res != SUCCESS)
   error_handler(outcome, diag);
/*
**  Perform a grouped activity on the destination file.
**   ft_bgroup
**      ft_create
**      ft_open
**   ft_egroup
**
**   Get the parameters for ft_bgroup.
**   Call ft_bgroup and verify the outcome.
*/
(void)printf("Creating and opening the destination file...\n");
bgr_parm_in( & threshold, & return_event_name, & bgr_input_dcb,
             & bgr_inout_dcb );
res = ft_bgroup(conn_id[DST], threshold, return_event_name,
                  bgr_input_dcb, & bgr_inout_dcb);
if (res != SUCCESS)
   error_handler(bgr_inout_dcb->result, diag);
/*
**   Get the parameters for ft_create.
**   Call ft_create and verify the outcome.
*/
cre_parm_in( & dst_filename, & contents_type,
             & requested_access, & file_status, & return_event_name,
             & cre_input_dcb, & cre_inout_dcb );
/*
**  Set the attributes and contents_type of the destination file
**  to be identical with those of the source file.
*/
cre_input_dcb->attributes = attr_src;
contents_type = attr_src.values.contents_type;
res = ft_create(conn_id[DST], dst_filename, contents_type,
                  requested_access, file_status, return_event_name,
                  cre_input_dcb, & cre_inout_dcb);
if (res != SUCCESS)
   error_handler(cre_inout_dcb->result, cre_inout_dcb->diagnostic);
```

```
/*
**   Get the parameters for ft_open.
**   Call ft_open and verify the outcome.
*/
ope_parm_in( & processing_mode, & contents_type,
             & return_event_name, & ope_input_dcb, & ope_inout_dcb );
contents_type = attr_src.values.contents_type;
return_event_name = 3;
res = ft_open(conn_id[DST], processing_mode, contents_type,
                return_event_name, ope_input_dcb, & ope_inout_dcb);
if (res != SUCCESS)
   error_handler(ope_inout_dcb->result, ope_inout_dcb->diagnostic);
/*
**   Get the parameters for ft_egroup.
**   Call ft_egroup and verify the outcome.
*/
egr_parm_in( & return_event_name, & egr_input_dcb, & egr_inout_dcb );
res = ft_egroup(conn_id[DST], return_event_name, egr_input_dcb,
                 & egr_inout_dcb);
if (res != SUCCESS)
   error_handler(egr_inout_dcb->result, diag);
/*
**   Wait on the asynchronous events in the group.
*/
for (i = 1; i %<M=> 3; ++i) {
  wait_parm_in( & time, & result );
  res = em_wait(time, & return_event_name, & result);
  if (res != SUCCESS)
     error_handler(result, diag);
  switch (return_event_name) {
    case 1:
      if (bgr_inout_dcb->result.return_code != SUCCESS)
         error_handler(bgr_inout_dcb->result, diag);
      break;
    case 2:
      if (cre_inout_dcb->result.return_code != SUCCESS)
         error_handler(cre_inout_dcb->result,
                       cre_inout_dcb->diagnostic);
      break;
    case 3:
      if (ope_inout_dcb->result.return_code != SUCCESS)
         error_handler(ope_inout_dcb->result,
                       ope_inout_dcb->diagnostic);
      break;
    default:
      break;
  }
}
```

```
/*
**   Free memory.
*/
res = ft_dfdcb((Octet *)rat_input_dcb, & outcome);
if (res != SUCCESS)
   error_handler(outcome, diag);
res = ft_dfdcb((Octet *)rat_inout_dcb, & outcome);
if (res != SUCCESS)
   error_handler(outcome, diag);
res = ft_dfdcb((Octet *)bgr_inout_dcb, & outcome);
if (res != SUCCESS)
   error_handler(outcome, diag);
res = ft_dfdcb((Octet *)cre_input_dcb, & outcome);
if (res != SUCCESS)
   error_handler(outcome, diag);
res = ft_dfdcb((Octet *)cre_inout_dcb, & outcome);
if (res != SUCCESS)
   error_handler(outcome, diag);
res = ft_dfdcb((Octet *)ope_input_dcb, & outcome);
if (res != SUCCESS)
   error_handler(outcome, diag);
res = ft_dfdcb((Octet *)ope_inout_dcb, & outcome);
if (res != SUCCESS)
   error_handler(outcome, diag);
res = ft_dfdcb((Octet *)egr_inout_dcb, & outcome);
if (res != SUCCESS)
   error_handler(outcome, diag);
/*
**   Receive data from the source file.
**
**   Get the parameters for ft_read.
**   Call ft_read and verify the outcome.
*/
(void)printf("Reading data from the source file");
(void)printf("and writing data to the destination file...\n");
rea_parm_in( & fadu_identity, & access_context, & return_event_name,
             & rea_input_dcb, & rea_inout_dcb );
res = ft_read(conn_id[SRC], fadu_identity, access_context,
               return_event_name, rea_input_dcb, & rea_inout_dcb);
if (res != SUCCESS)
   error_handler(rea_inout_dcb->result, diag);
/*
**   Free memory.
*/
res = ft_dfdcb((Octet *)rea_inout_dcb, & outcome);
if (res != SUCCESS)
   error_handler(outcome, diag);
/*
**   Write to the destination file.
**
**   Get the parameters for ft_write.
**   Call ft_write and verify the outcome.
*/
wri_parm_in( & fadu_identity, & fadu_operation, & return_event_name,
             & wri_input_dcb, & wri_inout_dcb );
res = ft_write(conn_id[DST], fadu_identity, fadu_operation,
                return_event_name, wri_input_dcb, & wri_inout_dcb);
if (res != SUCCESS)
   error_handler(wri_inout_dcb->result, diag);
```

```
/*
**   Free memory.
*/
res = ft_dfdcb((Octet *)wri_inout_dcb, & outcome);
if (res != SUCCESS)
   error_handler(outcome, diag);
/*
**   Replace the contents of destination file with the contents
**   of source file.
*/
done = FALSE;
while ( ! done ) {
   /*
   **   Read from the source file.
   **
   **   Get the parameters for ft_rdata.
   **   Call ft_rdata and verify the outcome.
   */
   rda_parm_in(& des_requested, & return_event_name, & rda_inout_dcb);
   res = ft_rdata(conn_id[SRC], des_requested, return_event_name,
                  & rda_inout_dcb);
   if (res != SUCCESS)
      error_handler(rda_inout_dcb->result,
                    rda_inout_dcb->diagnostic);
   /*
   **   If a cancel indication returned, stop
   **   transferring data.
   */
   data_unit = rda_inout_dcb->data_unit;
   for (index = 1; index rda_inout_dcb->des_received; index++)
       data_unit = data_unit->next;
   if (data_unit->structure_id == FT_CANCEL_IND) {
      rda_inout_dcb ->data_unit = NULL;
      done = TRUE;
   }
   /*
   **      If only a data end indication was returned,
   **      stop transfering data.
   */
   if (rda_inout_dcb->des_received == 1 & &
      rda_inout_dcb->data_unit->structure_id == FT_DATA_END_IND) {
      rda_inout_dcb ->data_unit = NULL;
      done = TRUE;
   }
   /*
   **   Move the data_element next pointer to the next to the
   **   last data_element and check for a data end indication
   **   on the last data_element. If one exists, set the next pointer
   **   to NULL so the last data_element is not written
   **   during the ft_sdata call.
   */
   if ( ! done ) {
      data_unit = rda_inout_dcb->data_unit;
      for (index = 2; index rda_inout_dcb->des_received; index ++)
          data_unit = data_unit->next;
      if (data_unit->next->structure_id == FT_DATA_END_IND) {
         data_unit->next = NULL;
         done = TRUE;
      }
   }
```

```
            /*
            **   Send data to the destination file.
            **
            **   Get the parameters for ft_sdata.
            **   Call ft_sdata and verify the outcome.
            */
            if (rda_inout_dcb ->data_unit != NULL) {
               sda_parm_in(& return_event_name, & sda_inout_dcb);
               res = ft_sdata(conn_id[DST], rda_inout_dcb->data_unit,
                              return_event_name, & sda_inout_dcb);
               if (res != SUCCESS) {
                  /*
                  **   If a “No connection resources” error was returned,
                  **   wait until the resources are free.
                  */
                  if (res == FTE008_NO_CON_RESOURCES) {
                      /*
                      **   Get the parameters for ft_nwcleared.
                      **   Call ft_nwcleared and verify the outcome.
                      */
                     nwc_parm_in( & return_event_name, & nwc_inout_dcb );
                     res = ft_nwcleared(conn_id[DST], return_event_name,
                                        & nwc_inout_dcb);
                     if (res != SUCCESS)
                        error_handler(nwc_inout_dcb->result, diag);
                     /*
                     **   Free memory.
                     */
                     res = ft_dfdcb((Octet *)nwc_inout_dcb, & outcome);
                     if (res != SUCCESS)
                        error_handler(outcome, diag);
                  }
                  else {
                     error_handler(sda_inout_dcb->result,
                                   sda_inout_dcb->diagnostic);
                  }
               }
               /*
               **   Free memory.
               */
               res = ft_dfdcb((Octet *)sda_inout_dcb, & outcome);
               if (res != SUCCESS)
                  error_handler(outcome, diag);
            }
            /*
            **   Free memory.
            */
            res = ft_dfdcb((Octet *)rda_inout_dcb, & outcome);
            if (res != SUCCESS)
               error_handler(outcome, diag);
         }
         /*
         **   Send a data end to the destination file.
         **   Get the parameters for ft_edata.
         **   Call ft_edata and verify the outcome.
         */
         eda_parm_in(& return_event_name, & eda_input_dcb, & eda_inout_dcb);
         res = ft_edata(conn_id[DST], return_event_name, eda_input_dcb,
                        & eda_inout_dcb);
         if (res != SUCCESS)
            error_handler(eda_inout_dcb->result, eda_inout_dcb->diagnostic);
```

```
/*
**   Free memory.
*/
res = ft_dfdcb((Octet *)eda_input_dcb, & outcome);
if (res != SUCCESS)
   error_handler(outcome, diag);
res = ft_dfdcb((Octet *)eda_inout_dcb, & outcome);
if (res != SUCCESS)
   error_handler(outcome, diag);
/*
**   End the transfer of data to the source and destination files.
**
**   Get the parameters for ft_etransfer.
**   Call ft_etransfer and verify the outcome.
*/
(void)printf("Ending data transfer for the source file");
(void)printf(" &  the destination file...\n");
for (i = 0; i TWO_CONNECTIONS; ++i) {
    etr_parm_in( & return_event_name, & etr_input_dcb, & etr_inout_dcb );
    res = ft_etransfer(conn_id[i], return_event_name, etr_input_dcb,
                       & etr_inout_dcb);
    if (res != SUCCESS)
       error_handler(etr_inout_dcb->result, etr_inout_dcb->diagnostic);
    /*
    **   Free memory.
    */
    res = ft_dfdcb((Octet *)etr_inout_dcb, & outcome);
    if (res != SUCCESS)
       error_handler(outcome, diag);
}
/*
**   Perform a grouped activity on the source and destination files.
**   ft_bgroup
**      ft_close
**      ft_deselect
**   ft_egroup
**
**   Get the parameters for ft_bgroup.
**   Call ft_bgroup and verify the outcome.
*/
(void)printf("Closing and deselecting the source file");
(void)printf(" &  the destination file...\n");
for (i = 0; i TWO_CONNECTIONS; ++i) {
    bgr_parm_in( & threshold, & return_event_name, & bgr_input_dcb,
                 & bgr_inout_dcb );
    res = ft_bgroup(conn_id[i], threshold, return_event_name,
                    bgr_input_dcb, & bgr_inout_dcb);
    if (res != SUCCESS)
       error_handler(bgr_inout_dcb->result, diag);
    /*
    **   Get the parameters for ft_close.
    **   Call ft_close and verify the outcome.
    */
    clo_parm_in( & return_event_name, & clo_input_dcb, & clo_inout_dcb );
    res = ft_close(conn_id[i], return_event_name, clo_input_dcb,
                   & clo_inout_dcb);
    if (res != SUCCESS)
       error_handler(clo_inout_dcb->result, clo_inout_dcb->diagnostic);
```

```
            /*
            **   Get the parameters for ft_deselect.
            **   Call ft_deselect and verify the outcome.
            */
            des_parm_in( & return_event_name, & des_input_dcb, & des_inout_dcb );
            res = ft_deselect(conn_id[i], return_event_name, des_input_dcb,
                              & des_inout_dcb);
            if (res != SUCCESS)
               error_handler(des_inout_dcb->result, des_inout_dcb->diagnostic);
            /*
            **   Get the parameters for ft_egroup.
            **   Call ft_egroup and verify the outcome.
            */
            egr_parm_in( & return_event_name, & egr_input_dcb, & egr_inout_dcb );
            res = ft_egroup(conn_id[i], return_event_name, egr_input_dcb,
                            & egr_inout_dcb);
            if (res != SUCCESS)
               error_handler(egr_inout_dcb->result, diag);
            /*
            **   Wait on the asynchronous events in the group.
            */
            for (j = 1; j %<M=> 3; ++j) {
              wait_parm_in( & time, & result );
              res = em_wait(time, & return_event_name, & result);
              if (res != SUCCESS)
                 error_handler(result, diag);
              switch (return_event_name) {
                case 1:
                  if (bgr_inout_dcb->result.return_code != SUCCESS)
                     error_handler(bgr_inout_dcb->result, diag);
                  break;
                case 2:
                  if (clo_inout_dcb->result.return_code != SUCCESS)
                     error_handler(clo_inout_dcb->result,
                                   clo_inout_dcb->diagnostic);
                  break;
                case 3:
                  if (des_inout_dcb->result.return_code != SUCCESS)
                     error_handler(des_inout_dcb->result,
                                   des_inout_dcb->diagnostic);
                  break;
                default:
                  break;
              }
            }
            /*
            **   Free memory.
            */
            res = ft_dfdcb((Octet *)bgr_inout_dcb, & outcome);
            if (res != SUCCESS)
               error_handler(outcome, diag);
            res = ft_dfdcb((Octet *)clo_inout_dcb, & outcome);
            if (res != SUCCESS)
               error_handler(outcome, diag);
            res = ft_dfdcb((Octet *)des_inout_dcb, & outcome);
            if (res != SUCCESS)
               error_handler(outcome, diag);
            res = ft_dfdcb((Octet *)egr_inout_dcb, & outcome);
            if (res != SUCCESS)
               error_handler(outcome, diag);
        }
```

```
        /*
        **   Release the connections between ftam_init and the
        **   responders for the source file and the destination file.
        **
        **   Get the parameters for ft_rrequest.
        **   Call ft_rrequest and verify the outcome.
        */
        (void)printf("Releasing connections...\n");
        for (i = 0; i TWO_CONNECTIONS; ++i) {
            rre_parm_in( & return_event_name, & rre_input_dcb, & rre_inout_dcb );
            res = ft_rrequest(conn_id[i], return_event_name, rre_input_dcb,
                              & rre_inout_dcb);
            if (res != SUCCESS)
               error_handler(rre_inout_dcb->result, diag);
            /*
            **   Free memory.
            */
            res = ft_dfdcb((Octet *)rre_inout_dcb, & outcome);
            if (res != SUCCESS)
               error_handler(outcome, diag);
        }
        /*
        **   Deactivate ftam_init
        **
        **   Get the parameters for ft_aedeactivation.
        **   Call ft_aedeactivation and verify the outcome.
        */
        (void)printf("Deactivating ftam_init...\n");
        aed_parm_in( & return_event_name, & aed_inout_dcb );
        res = ft_aedeactivation(ae_label, return_event_name, & aed_inout_dcb);
        if (res != SUCCESS)
           error_handler(aed_inout_dcb->result, diag);
        /*
        **   Free memory.
        */
        res = ft_dfdcb((Octet *)aed_inout_dcb, & outcome);
        if (res != SUCCESS)
           error_handler(outcome, diag);
        (void)printf("ftm_llcopy: finished\n");
        return(SUCCESS);
    }
```

Setting Ae_dir_dn and P_address Utility Example

This routine sets the directory distinguished name and presentation address for the first three examples.

```
#include %</opt/ftam/include/map.h>
#include %</opt/ftam/include/mapftam.h>
#include “ftm_globs.h”
#include %<stdio.h>
#include %<malloc.h>
/*
**
**                              convert_ddn
**
**   DESCRIPTION:
**     This routine scans a character string and sets up
**     an Ae_dir_name.
**
**
**   PARAMETERS:
**     Inputs:
**       name:              string identifying the Directory Distinguished
**                          Name
**
**     Outputs:
**       dirname:           address of the pointer to the Dir_dn structure
**
**
*/
void
convert_ddn(dirname, name)
Ae_dir_name                  *dirname;
char                         *name;
{
char                         *attr;
char                         *value;
int                          i=0, j=0, k=0, index=0;
Bool                         val_flag=0, null_flag=0;
     /*
     **   Determine the number of rdns.
     */
     while (name[j] != NULL) {
       if (name[j] == ‘/’)
          ++index;
       ++j;
     }
     /*
     **   Malloc memory.
     */
     attr = (char *)malloc(strlen(name) + 1);
     value = (char *)malloc(strlen(name) + 1);
```

```
*dirname = (struct Dir_dn *)malloc(sizeof(struct Dir_dn));
(*dirname)->rdn = (struct Dir_rdn *)malloc(index*sizeof(struct Dir_rdn));
/*
**   Set the Ae_dir_name.
*/
(*dirname)->n = index;
/*
**   Parse the string and set up the Dir_dn structure.
**
**   NOTE:  index is set to "-1" since the string MUST start with
**          a delimiter "/".
*/
j = 0;
index = -1;
while ( !null_flag ) {
  /*
  **   Have we reached the end of the string?
  */
  if (name[j] == NULL)
     null_flag = TRUE;
  /*
  **   "/" is the signal for another Dir_rdn structure.
  */
  if ((name[j] != '/') & &  ( !null_flag )) {
     /*
     **   Is the attribute or the value of the attribute being parsed?
     */
     if (name[j] == '=') {
        val_flag = TRUE;
     } else if (val_flag) {
        value[i] = name[j];
        ++i;
     } else {
        attr[k] = name[j];
        ++k;
     }
     ++j;
  }
  value[i] = attr[k] = '\0';
  /*
  **   Has the end of the string or the delimiter for
  **   another rdn structure been reached?
  */
  if ((null_flag) || (name[j] == '/')) {
     if ((i != 0) & &  (k != 0)) {
        (*dirname)->rdn[index].n = 1;
        (*dirname)->rdn[index].avas =
                (struct Dir_ava *)malloc(sizeof(struct Dir_ava));
        (*dirname)->rdn[index].avas->attr_id.length = 1;
        (*dirname)->rdn[index].avas->attr_id.element =
            (Sint32 *)malloc(sizeof(Sint32));
        /*
        **   Set up the attr_value.
        */
        (*dirname)->rdn[index].avas->attr_value.pointer =
             (Octet *)malloc(i*sizeof(Octet));
        memcpy((char *)(*dirname)->rdn[index].avas->attr_value.pointer,
               value,i);
        (*dirname)->rdn[index].avas->attr_value.length = i;
```

```
                /*
                **   Set up the syntax_id to NULL.    -- For Future Use --
                */
                (*dirname)->rdn[index].avas->syntax_id.length = 0;
                (*dirname)->rdn[index].avas->syntax_id.element = NULL;
                /*
                **   Which attribute is this? Set the fourth element of the
                **   attr_id accordingly.
                */
                if (strcmp(attr,"C") == SUCCESS) {
                     /*
                     **   C = Country
                     */
                     (*dirname)->rdn[index].avas->attr_id.element[0] = 6;
                } else if (strcmp(attr,"L") == SUCCESS) {
                     /*
                     **   L = Locality
                     */
                     (*dirname)->rdn[index].avas->attr_id.element[0] = 7;
                } else if (strcmp(attr,"O") == SUCCESS) {
                     /*
                     **   O = Organization
                     */
                     (*dirname)->rdn[index].avas->attr_id.element[0] = 10;
                } else if (strcmp(attr,"OU") == SUCCESS) {
                     /*
                     **   OU = Organizational Unit
                     */
                     (*dirname)->rdn[index].avas->attr_id.element[0] = 11;
                } else if ((strcmp(attr,"CN") == SUCCESS) ||
                           (strcmp(attr,"AE") == SUCCESS) ||
                           (strcmp(attr,"AP") == SUCCESS)) {
                     /*
                     **   CN = Common Name
                     **   AE = Application Entity
                     **   AP = Application Process
                     */
                     (*dirname)->rdn[index].avas->attr_id.element[0] = 3;
                } else {
                     /*
                     **   Unsupported attr_id.
                     */
                     (*dirname)->rdn[index].avas->attr_id.element[0] = 9999;
                }
                /*
                **   Reset counters and flags for the next rdn structure
                */
                i = 0;
                k = 0;
                ++j;
                ++index;
                val_flag = 0;
                /*
                **   If there is another delimiter, move to the next
                **   Dir_rdn structure and the next character in the string.
                */
                while (name[j] == '/') {
                  ++j;
                  ++index;
                }
           }
```

```
            else {
             /*
             **   Move to the next character in the string and the next
             **   Dir_rdn structure in the Dir_dn structure.
             */
             ++j;
             ++index;
           }
         }
       }
}
/*
**
**                          convert_paddr
**
**   DESCRIPTION:
**     This routine scans a character string and sets up
**     a P_address.
**
**
**   PARAMETERS:
**     Inputs:
**       name:              string for P_address
**
**     Outputs:
**       p_addr:            pointer to the P_address
**
*/
void
convert_paddr(p_addr, name)
struct P_address             *p_addr;
char                         *name;
{
char                         *temp;
int                          i=0, j=0, index=0;
Bool                         null_flag=0;
     /*
     **   Malloc memory.
     */
     temp = (char *)malloc(strlen(name) + 1);
     p_addr->p_selector = (struct Octet_string *)malloc
             (sizeof(struct Octet_string));
     p_addr->s_selector = (struct Octet_string *)malloc
             (sizeof(struct Octet_string));
     p_addr->t_selector = (struct Octet_string *)malloc
             (sizeof(struct Octet_string));
     p_addr->nsaps = (struct Octet_string *)malloc
             (8*sizeof(struct Octet_string));
     /*
     **   How many nsaps?
     */
     while (name[j] != NULL) {
       if (name[j] == '.')
          ++index;
       ++j;
     }
     p_addr->n_nsaps = index - 2;
```

```
        /*
        **   Set the p_addr.
        */
        j = 0;
        index = 0;
        while ( !null_flag ) {
          /*
          **   Has the end of the string been reached?
          */
          if (name[j] == NULL)
             null_flag = TRUE;
          /*   Parse the next field until a delimiter or the
          **   end of the string has been reached.
          */
          if ((name[j] != '.') &  ( !null_flag )) {
             temp[i] = name[j];
             ++i;
             ++j;
          }
          /*
          **   Another field has been parsed; set up the correct p_addr field.
          */
          if ((null_flag) || (name[j] == '.')) {
             if (i != 0) {
                ++index;
                switch (index) {
                  case 1:
                     /*   p_selector
                     */
                     p_addr->p_selector->pointer = (Octet *)malloc
                          (i*sizeof(Octet));
                     char_to_hex(temp, i, (char *)p_addr->p_selector->pointer,
                               & (p_addr->p_selector->length));
                     break;
                  case 2:
                     /*   s_selector
                     */
                     p_addr->s_selector->pointer = (Octet *)malloc
                          (i*sizeof(Octet));
                     char_to_hex(temp, i, (char *)p_addr->s_selector->pointer,
                               & (p_addr->s_selector->length));
                     break;
                  case 3:
                     /*   t_selector
                     */
                     p_addr->t_selector->pointer = (Octet *)malloc
                          (i*sizeof(Octet));
                     char_to_hex(temp, i, (char *)p_addr->t_selector->pointer,
                               & (p_addr->t_selector->length));
                     break;
                  default:
                     /*   nsaps ... could be multiple nsaps.
                     */
                     p_addr->nsaps[index - 4].pointer = (Octet *)malloc
                          (i*sizeof(Octet));
                     char_to_hex(temp, i, (char *)p_addr->nsaps[index -
4].pointer,
                               & (p_addr->nsaps[index - 4].length));
                     break;
                }
```

```
                /*
                **   Reset the counters and flags for the next field.
                */
                i = 0;
                ++j;
                while (name[j] == '.') {
                  /*
                  **    Move to the next field in the p_addr
                  **    and the next character in the string.
                  */
                  ++index;
                  ++j;
                }
              }
              else {
                /*
                **    Move to the next field in the p_addr and the next
                **    character in the string.
                */
                ++j;
                ++index;
              }
            }
          }
        }
}
/*
**                              char_to_hex
**
**   DESCRIPTION:
**     Convert a character string of hex characters into a p_addr
**     string.
**
**   PARAMETERS
**     Inputs:
**       ch_string:             char hex string
**       ch_length:             char string length
**
**     Outputs:
**       padr_string:           P_address byte string
**       padr_length:           P_address string length
**
**   ALGORITHM:
**        Fill the P_address byte string with zeros.
**        For each two hex characters in the character string:
**           Convert the first character to a 4 bit value.
**           Put the value in the 1st 4 bits of the next P_address byte.
**           Convert the second character to a 4 bit value.
**           Put the value in the last 4 bits of the P_address byte.
**           Set the length of the P_address byte string.
**
*/
```

```
void
char_to_hex(ch_string, ch_length, padr_string, padr_length)
char              *ch_string;
int               ch_length;
char              *padr_string;
Uint32            *padr_length;
{
static char hex[] = “0123456789ABCDEF”;
int               padr_index;
int               ch_index;
char              ch;
char              *position;
        if (ch_length % 2 != 0) {
           (void)printf(“Character string won't fit into P_address field\n”);
           exit(ERROR);
        }
        /*
        **   Fill the p_addr byte with zeros.
        */
        for (padr_index = 0; padr_index %< (ch_length/2); ++padr_index)
            padr_string[padr_index] = 0x00;
        padr_index = 0;
        ch_index = 0;
        while (ch_index %< ch_length) {
           /*
           **   Put the first hex char into first half of byte.
           */
           ch = ch_string[ch_index];
           if (ch == ‘\0’) {
              break;
           }
           position = strchr(hex, ch);
           if (position == NULL) {
              (void)printf(“Invalid hex character in P_address\n”);
              exit(ERROR);
           }
           padr_string[padr_index] = (position-hex) %<%< 4;
           ++ch_index;
           /*
           **   Put the second hex char into second half of byte.
           */
           ch = ch_string[ch_index];
           if (ch == ‘\0’) {
              break;
           }
           position = strchr(hex, ch);
           if (position == NULL) {
              (void)printf(“Invalid hex character in P_address\n”);
              exit(ERROR);
           }
           padr_string[padr_index] |= ((position-hex) &  0x0F);
           ++ch_index;
           ++padr_index;
        }
        *padr_length = padr_index;
}
```

Checking for Errors Example

This example checks the function return value and the result.return_code, result.vendor_code, and diagnostic structures. This example also uses printf() statements to print the results. Use this routine in conjunction with the first three examples in this chapter: Using HLCF Functions Example, Managing FTAM Connections Example, and Using LLCS Example.

```
#include %</opt/ftam/include/map.h>
#include %</opt/ftam/include/mapftam.h>
#include %<stdio.h>
/*
**                            error_handler
**
**   DESCRIPTION:
**     This routine is an example of handling failures experienced
**     during the FTAM functions. This routine will display the
**     error messages.
**
**  PARAMETERS:
**    INPUT:
**      result :              the MAP and HP error information
**      diag :                the ISO error information
**
*/
void
error_handler(result, diag)
Api_rc                          result;
struct Ft_diagnostic            *diag;
{
Return_code                     res;
Api_rc                          outcome;
Octet                           *return_string;
Octet                           *vendor_string;
struct Ft_diagnostic            *ft_diag = NULL;
        /*
        **   Initialize variables.
        */
        return_string = NULL;
        vendor_string = NULL;
```

```
            /*
            **   Call ft_gperror to get the printable strings for
            **   the return_code and vendor_code. Print the
            **   strings returned from ft_gperror.
            */
           res = ft_gperror( & result, & return_string, & vendor_string, & outcome
    );
            if (res == SUCCESS) {
               if (return_string != NULL) {
                  (void)printf("FTAM failure: return_code = %s\n", return_string);
                  res = ft_fdmemory(return_string, & outcome);
                  if (res != SUCCESS)
                     error_handler(outcome, ft_diag);
               }
               /*
               **   Print the vendor_code if it exists.
               */
               if (vendor_string != NULL) {
                  (void)printf("FTAM failure: vendor_code = %s\n", vendor_string);
                  res = ft_fdmemory(vendor_string, & outcome);
                  if (res != SUCCESS)
                     error_handler(outcome, ft_diag);
               }
            }
            /*
            **   Traverse the diagnostic list and print the further_details strings.
            */
            while(diag != NULL) {
                (void)printf("FTAM failure: diagnostic number = %d\n",
                              diag->error_id);
                if(diag->further_details != NULL)
                    (void)printf("FTAM failure: diagnostic = %s\n",
                                  diag->further_details);
                diag = diag->next;
            }
            exit(-1);
    }
```

Common Code Example

This example contains global definitions and common code for the first three examples in this chapter: Using HLCF Functions Example, Managing FTAM Connections Example, and Using LLCS Functions Example.

```
/*
**                          ftm_globs.h
**
**     DESCRIPTION:
**       This file contains global definitions for the example
**       programs illustrating HLCF calls, connection management,
**       and LLCS calls.
**
*/
#include %<sys/types.h>
/*
**  Constants
*/
#define ERROR                -1
#define TWO_CONNECTIONS       2
#define SRC                   0
#define DST                   1
#define      SRC_ID           "src_id"
#define      SRC_ID_LEN       6
#define      SRC_PW           "src_pw"
#define      SRC_PW_LEN       6
#define      SRC_FNAME        "/tmp/src_fname"
#define      DEST_FNAME       "/tmp/dest_fname"
#define      DEST_ID          "dest_id"
#define      DEST_ID_LEN      7
#define      DEST_PW          "dest_pw"
#define      DEST_PW_LEN      7
#define      DEL_PW           "del_pw"
#define      DEL_PW_LEN       6
#define      CREAT_ID         "creator"
#define      CREAT_PW         "cre_pw"
#define      CREAT_PW_LEN     6
#define      LOCAL_INIT       "/C=us/O=company/OU=division/AP=node1/
AE=ftam_init"
#define      LOCAL_RESP       "/C=us/O=company/OU=division/AP=node1/
AE=ftam_resp"
#define      REMOTE_RESP      "/C=us/O=company/OU=division/AP=node2/
AE=ftam_resp"
#define      SRC_ACCOUNT      "account"
#define      DEST_ACCOUNT     "account"
#define      STORAGE_ACCOUNT  "stor_acct"
#define      SERVICE_CLASS    (FT_SC_UNCONSTRAINED | FT_SC_MANAGEMENT    \
                              | FT_SC_TRANSFER | FT_SC_TRANSFER_AND_MGMT \
                              | FT_SC_ACCESS)
#define      FUNCTIONAL_UNITS (FT_FU_READ | FT_FU_WRITE            \
                              | FT_FU_FILE_ACCESS | FT_FU_LTD_MGMT  \
                              | FT_FU_ENH_MGMT | FT_FU_GROUPING)
```

```
#define      ATTRIBUTE_GROUPS (FT_AG_STORAGE | FT_AG_SECURITY | FT_AG_PRIVATE)
/** Define functions that return values other than integers.
*/
void exit();
/*
** Define the “void” routines in the example routines.
*/
void convert_ddn();
void convert_paddr();
void char_to_hex();
void error_handler();
void passwords_in();
void cat_attribute_in();
void attribute_in();
void ftam_3();
void concur_cntl_in();
void fadu_ident_in();
void wait_parm_in();
void aea_parm_in();
void aed_parm_in();
void con_parm_in();
void rre_parm_in();
void sel_parm_in();
void des_parm_in();
void ope_parm_in();
void clo_parm_in();
void rat_parm_in();
void cre_parm_in();
void bgr_parm_in();
void egr_parm_in();
void nwc_parm_in();
void rea_parm_in();
void wri_parm_in();
void sda_parm_in();
void rda_parm_in();
void eda_parm_in();
void etr_parm_in();
void fca_parm_in();
void fde_parm_in();
void fco_parm_in();
void exit();
size_t strlen();
char *strchr();
void *memcpy();
#include %</opt/ftam/include/map.h>
#include %</opt/ftam/include/mapftam.h>
#include “ftm_globs.h”
#include %<stdio.h>
```

```
main()
/*
**                                ftm_hlcopy
**
**   DESCRIPTION:
**     This example program uses high level, context free functions
**     synchronously. This program copies a file, changes the
**     attributes of the destination file and deletes the source file.
**
*/
{

Ae_label                          ae_label;
Ae_dir_name                       source_dirname;
Ft_filename                       source_filename;
Ae_dir_name                       destination_dirname;
Ft_filename                       destination_filename;
Local_event_name                  return_event_name;
struct Ft_fcopy_in_dcb            *fco_input_dcb;
struct Ft_fcopy_out_dcb           *fco_inout_dcb;
struct Ft_fcattributes_in_dcb     *fca_input_dcb;
struct Ft_fcattributes_out_dcb    *fca_inout_dcb;
struct Ft_fdelete_in_dcb          *fde_input_dcb;
struct Ft_fdelete_out_dcb         *fde_inout_dcb;
Return_code                       res;
Api_rc                            outcome;
struct Ft_diagnostic              *diag = NULL;
     (void)printf("ftm_fcopy: starting\n");
     /*
     **   Copy the source file to the destination directory.
     **
     **   Get the parameters for ft_fcopy.
     **   Call ft_fcopy and verify the outcome.
     */
     (void)printf("Copying the source file to the destination directory...\n");
     fco_parm_in( & source_dirname, & source_filename,
                  & destination_dirname, & destination_filename,
                  & ae_label, & return_event_name, & fco_input_dcb,
                  & fco_inout_dcb );
     res = ft_fcopy(source_dirname, source_filename, destination_dirname,
                    destination_filename, & ae_label,
                    return_event_name, fco_input_dcb, & fco_inout_dcb);
     if (res != SUCCESS)
        error_handler(fco_inout_dcb-result, fco_inout_dcb-diagnostic);
     /*
     **   Free memory.
     */
     res = ft_dfdcb((Octet *)fco_input_dcb, & outcome);
     if (res != SUCCESS)
        error_handler(outcome, diag);
     res = ft_dfdcb((Octet *)fco_inout_dcb, & outcome);
     if (res != SUCCESS)
        error_handler(outcome, diag);
```

```
        /*
        **   Change the attributes of the destination file.
        **
        **   Get the parameters for ft_fcattributes.
        **   Call ft_fcattributes and verify the outcome.
        */
        (void)printf("Changing attributes of the destination file...\n");
        fca_parm_in( & destination_dirname, & destination_filename,
                     & ae_label, & return_event_name, & fca_input_dcb,
                     & fca_inout_dcb );
        res = ft_fcattributes(destination_dirname, destination_filename,
                              & ae_label, return_event_name, fca_input_dcb,
                              & fca_inout_dcb);
        if (res != SUCCESS)
           error_handler(fca_inout_dcb-result, fca_inout_dcb-diagnostic);
        /*
        **   Free memory.
        */
        res = ft_dfdcb((Octet *)fca_input_dcb, & outcome);
        if (res != SUCCESS)
           error_handler(outcome, diag);
        res = ft_dfdcb((Octet *)fca_inout_dcb, & outcome);
        if (res != SUCCESS)
           error_handler(outcome, diag);
        /*
        **   Delete the source file.
        **
        **   Get the parameters for ft_fdelete.
        **   Call ft_fdelete and verify the outcome.
        */
        (void)printf("Deleting the source file...\n");
        fde_parm_in( & source_dirname, & source_filename,
                     & ae_label, & return_event_name, & fde_input_dcb,
                     & fde_inout_dcb );
        res = ft_fdelete(source_dirname, source_filename, & ae_label,
                         return_event_name, fde_input_dcb, & fde_inout_dcb);
        if (res != SUCCESS)
           error_handler(fde_inout_dcb-result, fde_inout_dcb-diagnostic);
        /*
        **   Free memory.
        */
        res = ft_dfdcb((Octet *)fde_input_dcb, & outcome);
        if (res != SUCCESS)
           error_handler(outcome, diag);
        res = ft_dfdcb((Octet *)fde_inout_dcb, & outcome);
        if (res != SUCCESS)
           error_handler(outcome, diag);
        (void)printf("ftm_hlcopy: finished\n");
        return(SUCCESS);
    }
```

```
#include %</opt/ftam/include/map.h>
#include %</opt/ftam/include/mapftam.h>
#include “ftm_globs.h”
#include %<stdio.h>
main()
/*
**                                ftm_llcopy
** DESCRIPTION:
**   This example program illustrates how to transfer a file
**   using low level, context sensitive FTAM functions. This
**   program transfers the source file to the destination directory.
**
*/
{
Ae_dir_name                   my_dirname;
Ae_dir_name                   dirname;
Ae_label                      ae_label;
Local_event_name              return_event_name;
Connection_id                 conn_id[TWO_CONNECTIONS];
Ft_filename                   src_filename;
Ft_filename                   dst_filename;
Ft_processing_mode            processing_mode;
Ft_file_actions               requested_access;
enum Ft_file_status           file_status;
enum Ft_access_context        access_context;
enum Ft_fadu_operation        fadu_operation;
struct Ft_fadu_identity       fadu_identity;
struct Ft_contents_type       contents_type;
Uint16                        threshold;
Uint16                        des_requested;
struct Ft_data_unit           *data_unit;
struct Ft_aeactivate_in_dcb   *aea_input_dcb;
struct Ft_output              *aea_inout_dcb;
struct Ft_connect_in_dcb      *con_input_dcb;
struct Ft_connect_out_dcb     *con_inout_dcb;
struct Ft_relreq_in_dcb       *rre_input_dcb;
struct Ft_relreq_out_dcb      *rre_inout_dcb;
struct Ft_output              *aed_inout_dcb;
char                          *bgr_input_dcb;
struct Ft_bgroup_out_dcb      *bgr_inout_dcb;
char                          *egr_input_dcb;
struct Ft_egroup_out_dcb      *egr_inout_dcb;
struct Ft_select_in_dcb       *sel_input_dcb;
struct Ft_select_out_dcb      *sel_inout_dcb;
struct Ft_create_in_dcb       *cre_input_dcb;
struct Ft_create_out_dcb      *cre_inout_dcb;
struct Ft_rattributes_in_dcb  *rat_input_dcb;
struct Ft_rattributes_out_dcb *rat_inout_dcb;
struct Ft_open_in_dcb         *ope_input_dcb;
struct Ft_open_out_dcb        *ope_inout_dcb;
char                          *rea_input_dcb;
struct Ft_read_out_dcb        *rea_inout_dcb;
char                          *wri_input_dcb;
struct Ft_write_out_dcb       *wri_inout_dcb;
struct Ft_rdata_out_dcb       *rda_inout_dcb;
struct Ft_sdata_out_dcb       *sda_inout_dcb;
struct Ft_edata_in_dcb        *eda_input_dcb;
struct Ft_edata_out_dcb       *eda_inout_dcb;
char                          *etr_input_dcb;
struct Ft_etransfer_out_dcb   *etr_inout_dcb;
```

```
struct Ft_nwcleared_out_dcb   *nwc_inout_dcb;
char                          *clo_input_dcb;
struct Ft_close_out_dcb       *clo_inout_dcb;
char                          *des_input_dcb;
struct Ft_deselect_out_dcb    *des_inout_dcb;
Em_t                          time;
Api_rc                        result;
struct Ft_attributes          attr_src;
Return_code                   res;
Api_rc                        outcome;
int                           i, j, index;
Bool                          done;
struct Ft_diagnostic          *diag = NULL;
     (void)printf("ftm_llcopy: starting\n");
     /*
     **   Activate "ftam_init".
     **
     **   Get the parameters for ft_aeactivation.
     **   Call ft_aeactivation and verify the outcome.
     */
     (void)printf("Activating ftam_init...\n");
     aea_parm_in( & my_dirname, & return_event_name, & aea_input_dcb,
                  & aea_inout_dcb, & ae_label );
     res = ft_aeactivation(my_dirname, return_event_name, aea_input_dcb,
                           & aea_inout_dcb, & ae_label);
     if (res != SUCCESS)
        error_handler(aea_inout_dcb-result, diag);
     /*
     **   Free memory.
     */
     res = ft_dfdcb((Octet *)aea_inout_dcb, & outcome);
     if (res != SUCCESS)
        error_handler(outcome, diag);
     /*
     **   Establish connections between ftam_init and the responder
     **   for the source file and between ftam_init and the responder
     **   for the destination file.
     **
     **   Get the parameters for ft_connect.
     **   Call ft_connect and verify the outcome.
     */
     (void)printf("Establishing connections for the source");
     (void)printf(" &  destination files...\n");
         con_source_parm_in( & return_event_name, & dirname, & con_input_dcb,
                       & con_inout_dcb, & conn_id[0] );
         res = ft_connect(ae_label, return_event_name, dirname,
                          con_input_dcb, & con_inout_dcb, & conn_id[0]);
         if (res != SUCCESS)
            error_handler(con_inout_dcb-result,
                          con_inout_dcb-connect_out_info-diagnostic);
```

```
    /*
    **   Free memory.
    */
    res = ft_dfdcb((Octet *)con_input_dcb, & outcome);
    if (res != SUCCESS)
       error_handler(outcome, diag);
    res = ft_dfdcb((Octet *)con_inout_dcb, & outcome);
    if (res != SUCCESS)
       error_handler(outcome, diag);
    con_parm_in( & return_event_name, & dirname, & con_input_dcb,
                 & con_inout_dcb, & conn_id[1] );
    res = ft_connect(ae_label, return_event_name, dirname,
                     con_input_dcb, & con_inout_dcb, & conn_id[1]);
    if (res != SUCCESS)
       error_handler(con_inout_dcb-result,
                     con_inout_dcb-connect_out_info-diagnostic);
    /*
    **   Free memory.
    */
    res = ft_dfdcb((Octet *)con_input_dcb, & outcome);
    if (res != SUCCESS)
       error_handler(outcome, diag);
    res = ft_dfdcb((Octet *)con_inout_dcb, & outcome);
    if (res != SUCCESS)
       error_handler(outcome, diag);
/*
**   Perform a grouped activity on the source file.
**   ft_bgroup
**      ft_select
**      ft_rattributes
**   ft_egroup
**   Get the parameters for ft_bgroup.
**   Call ft_bgroup and verify the outcome.
*/
(void)printf("Selecting and reading attributes of the source file...\n");
bgr_parm_in( & threshold, & return_event_name, & bgr_input_dcb,
             & bgr_inout_dcb );
res = ft_bgroup(conn_id[SRC], threshold, return_event_name,
                bgr_input_dcb, & bgr_inout_dcb);
if (res != SUCCESS)
   error_handler(bgr_inout_dcb-result, diag);
/*
**   Get the parameters for ft_select.
**   Call ft_select and verify the outcome.
*/
sel_parm_in( & src_filename, & requested_access,
             & return_event_name, & sel_input_dcb, & sel_inout_dcb );
res = ft_select(conn_id[SRC], src_filename, requested_access,
                return_event_name, sel_input_dcb, & sel_inout_dcb);
if (res != SUCCESS)
   error_handler(sel_inout_dcb-result, sel_inout_dcb-diagnostic);
/*
**   Get the parameters for ft_rattributes.
**   Call ft_rattributes and verify the outcome.
*/
rat_parm_in( & return_event_name, & rat_input_dcb, & rat_inout_dcb );
res = ft_rattributes(conn_id[SRC], return_event_name, rat_input_dcb,
                     & rat_inout_dcb);
if (res != SUCCESS)
   error_handler(rat_inout_dcb-result, rat_inout_dcb-diagnostic);
```

```
/*
**   Get the parameters for ft_egroup.
**   Call ft_egroup and verify the outcome.
*/
egr_parm_in( & return_event_name, & egr_input_dcb, & egr_inout_dcb );
res = ft_egroup(conn_id[SRC], return_event_name, egr_input_dcb,
                  & egr_inout_dcb);
if (res != SUCCESS)
   error_handler(egr_inout_dcb-result, diag);
/*
**   Wait on the asynchronous events in the group.
*/
for (i = 1; i %<= 3; ++i) {
  wait_parm_in( & time, & result );
  res = em_wait(time, & return_event_name, & result);
  if (res != SUCCESS)
     error_handler(result, diag);
  switch (return_event_name) {
    case 1:
      if (bgr_inout_dcb-result.return_code != SUCCESS)
         error_handler(bgr_inout_dcb-result, diag);
      break;
    case 2:
      if (sel_inout_dcb-result.return_code != SUCCESS)
         error_handler(sel_inout_dcb-result,
                       sel_inout_dcb-diagnostic);
      break;
    case 3:
      if (rat_inout_dcb-result.return_code != SUCCESS)
         error_handler(rat_inout_dcb-result,
                       rat_inout_dcb-diagnostic);
      break;
    default:
      break;
  }
}
/*
**   Save the attributes of the source file.
*/
attr_src = rat_inout_dcb-attributes;
/*
**   Free memory.
*/
res = ft_dfdcb((Octet *)bgr_inout_dcb, & outcome);
if (res != SUCCESS)
   error_handler(outcome, diag);
res = ft_dfdcb((Octet *)sel_input_dcb, & outcome);
if (res != SUCCESS)
   error_handler(outcome, diag);
res = ft_dfdcb((Octet *)sel_inout_dcb, & outcome);
if (res != SUCCESS)
   error_handler(outcome, diag);
res = ft_dfdcb((Octet *)egr_inout_dcb, & outcome);
if (res != SUCCESS)
   error_handler(outcome, diag);
```

```
/*
**   Open the source file.
**
**   Get the parameters for ft_open.
**   Call ft_open and verify the outcome.
*/
(void)printf("Opening the source file...\n");
ope_parm_in( & processing_mode, & contents_type,
             & return_event_name, & ope_input_dcb, & ope_inout_dcb);
res = ft_open(conn_id[SRC], processing_mode, contents_type,
               return_event_name, ope_input_dcb, & ope_inout_dcb);
if (res != SUCCESS)
   error_handler(ope_inout_dcb-result, ope_inout_dcb-diagnostic);
/*
**   Free memory.
*/
res = ft_dfdcb((Octet *)ope_input_dcb, & outcome);
if (res != SUCCESS)
   error_handler(outcome, diag);
res = ft_dfdcb((Octet *)ope_inout_dcb, & outcome);
if (res != SUCCESS)
   error_handler(outcome, diag);
/*
**  Perform a grouped activity on the destination file.
**   ft_bgroup
**      ft_create
**      ft_open
**   ft_egroup
**
**   Get the parameters for ft_bgroup.
**   Call ft_bgroup and verify the outcome.
*/
(void)printf("Creating and opening the destination file...\n");
bgr_parm_in( & threshold, & return_event_name, & bgr_input_dcb,
             & bgr_inout_dcb );
res = ft_bgroup(conn_id[DST], threshold, return_event_name,
                 bgr_input_dcb, & bgr_inout_dcb);
if (res != SUCCESS)
   error_handler(bgr_inout_dcb-result, diag);
/*
**   Get the parameters for ft_create.
**   Call ft_create and verify the outcome.
*/
cre_parm_in( & dst_filename, & contents_type,
             & requested_access, & file_status, & return_event_name,
             & cre_input_dcb, & cre_inout_dcb );
/*
**  Set the attributes and contents_type of the destination file
**  to be identical with those of the source file.
*/
cre_input_dcb-attributes = attr_src;
contents_type = attr_src.values.contents_type;
res = ft_create(conn_id[DST], dst_filename, contents_type,
                 requested_access, file_status, return_event_name,
                 cre_input_dcb, & cre_inout_dcb);
if (res != SUCCESS)
   error_handler(cre_inout_dcb-result, cre_inout_dcb-diagnostic);
```

```
/*
**   Get the parameters for ft_open.
**   Call ft_open and verify the outcome.
*/
ope_parm_in( & processing_mode, & contents_type,
             & return_event_name, & ope_input_dcb, & ope_inout_dcb );
contents_type = attr_src.values.contents_type;
return_event_name = 3;
res = ft_open(conn_id[DST], processing_mode, contents_type,
              return_event_name, ope_input_dcb, & ope_inout_dcb);
if (res != SUCCESS)
   error_handler(ope_inout_dcb-result, ope_inout_dcb-diagnostic);
/*
**   Get the parameters for ft_egroup.
**   Call ft_egroup and verify the outcome.
*/
egr_parm_in( & return_event_name, & egr_input_dcb, & egr_inout_dcb );
res = ft_egroup(conn_id[DST], return_event_name, egr_input_dcb,
                & egr_inout_dcb);
if (res != SUCCESS)
   error_handler(egr_inout_dcb-result, diag);
/*
**   Wait on the asynchronous events in the group.
*/
for (i = 1; i %<= 3; ++i) {
  wait_parm_in( & time, & result );
  res = em_wait(time, & return_event_name, & result);
  if (res != SUCCESS)
     error_handler(result, diag);
  switch (return_event_name) {
    case 1:
      if (bgr_inout_dcb-result.return_code != SUCCESS)
         error_handler(bgr_inout_dcb-result, diag);
      break;
    case 2:
      if (cre_inout_dcb-result.return_code != SUCCESS)
         error_handler(cre_inout_dcb-result,
                       cre_inout_dcb-diagnostic);
      break;
    case 3:
      if (ope_inout_dcb-result.return_code != SUCCESS)
         error_handler(ope_inout_dcb-result,
                       ope_inout_dcb-diagnostic);
      break;
    default:
      break;
  }
}
```

```
/*
**   Free memory.
*/
res = ft_dfdcb((Octet *)rat_input_dcb, & outcome);
if (res != SUCCESS)
   error_handler(outcome, diag);
res = ft_dfdcb((Octet *)rat_inout_dcb, & outcome);
if (res != SUCCESS)
   error_handler(outcome, diag);
res = ft_dfdcb((Octet *)bgr_inout_dcb, & outcome);
if (res != SUCCESS)
   error_handler(outcome, diag);
res = ft_dfdcb((Octet *)cre_input_dcb, & outcome);
if (res != SUCCESS)
   error_handler(outcome, diag);
res = ft_dfdcb((Octet *)cre_inout_dcb, & outcome);
if (res != SUCCESS)
   error_handler(outcome, diag);
res = ft_dfdcb((Octet *)ope_input_dcb, & outcome);
if (res != SUCCESS)
   error_handler(outcome, diag);
res = ft_dfdcb((Octet *)ope_inout_dcb, & outcome);
if (res != SUCCESS)
   error_handler(outcome, diag);
res = ft_dfdcb((Octet *)egr_inout_dcb, & outcome);
if (res != SUCCESS)
   error_handler(outcome, diag);
/*
**   Receive data from the source file.
**
**   Get the parameters for ft_read.
**   Call ft_read and verify the outcome.
*/
(void)printf("Reading data from the source file");
(void)printf("and writing data to the destination file...\n");
rea_parm_in( & fadu_identity, & access_context, & return_event_name,
            & rea_input_dcb, & rea_inout_dcb );
res = ft_read(conn_id[SRC], fadu_identity, access_context,
              return_event_name, rea_input_dcb, & rea_inout_dcb);
if (res != SUCCESS)
   error_handler(rea_inout_dcb-result, diag);
/*
**   Free memory.
*/
res = ft_dfdcb((Octet *)rea_inout_dcb, & outcome);
if (res != SUCCESS)
   error_handler(outcome, diag);
/*
**   Write to the destination file.
**
**   Get the parameters for ft_write.
**   Call ft_write and verify the outcome.
*/
wri_parm_in( & fadu_identity, & fadu_operation, & return_event_name,
            & wri_input_dcb, & wri_inout_dcb );
res = ft_write(conn_id[DST], fadu_identity, fadu_operation,
               return_event_name, wri_input_dcb, & wri_inout_dcb);
if (res != SUCCESS)
   error_handler(wri_inout_dcb-result, diag);
```

```
/*
**   Free memory.
*/
res = ft_dfdcb((Octet *)wri_inout_dcb, & outcome);
if (res != SUCCESS)
   error_handler(outcome, diag);
/*
**   Replace the contents of destination file with the contents
**   of source file.
*/
done = FALSE;
while ( ! done ) {
   /*
   **   Read from the source file.
   **
   **   Get the parameters for ft_rdata.
   **   Call ft_rdata and verify the outcome.
   */
   rda_parm_in(& des_requested, & return_event_name, & rda_inout_dcb);
   res = ft_rdata(conn_id[SRC], des_requested, return_event_name,
                  & rda_inout_dcb);
   if (res != SUCCESS)
      error_handler(rda_inout_dcb-result,
                    rda_inout_dcb-diagnostic);
   /*
   **   If a cancel indication returned, stop
   **   transferring data.
   */
   data_unit = rda_inout_dcb-data_unit;
   for (index = 1; index %< rda_inout_dcb-des_received; index++)
       data_unit = data_unit-next;
   if (data_unit-structure_id == FT_CANCEL_IND) {
      rda_inout_dcb -data_unit = NULL;
      done = TRUE;
   }
   /*
   **      If only a data end indication was returned,
   **      stop transfering data.
   */
   if (rda_inout_dcb-des_received == 1 & &
      rda_inout_dcb-data_unit-structure_id == FT_DATA_END_IND) {
      rda_inout_dcb -data_unit = NULL;
      done = TRUE;
   }
   /*
   **   Move the data_element next pointer to the next to the
   **   last data_element and check for a data end indication
   **   on the last data_element. If one exists, set the next pointer
   **   to NULL so the last data_element is not written
   **   during the ft_sdata call.
   */
   if ( ! done ) {
      data_unit = rda_inout_dcb-data_unit;
      for (index = 2; index %< rda_inout_dcb-des_received; index ++)
          data_unit = data_unit-next;
      if (data_unit-next-structure_id == FT_DATA_END_IND) {
         data_unit-next = NULL;
         done = TRUE;
      }
   }
```

```
   /*   Send data to the destination file.
   **
   **   Get the parameters for ft_sdata.
   **   Call ft_sdata and verify the outcome.
   */
   if (rda_inout_dcb -data_unit != NULL) {
      sda_parm_in(& return_event_name, & sda_inout_dcb);
      res = ft_sdata(conn_id[DST], rda_inout_dcb-data_unit,
                     return_event_name, & sda_inout_dcb);
      if (res != SUCCESS) {
         /*
         **   If a “No connection resources” error was returned,
         **   wait until the resources are free.
         */
         if (res == FTE008_NO_CON_RESOURCES) {
             /*
             **   Get the parameters for ft_nwcleared.
             **   Call ft_nwcleared and verify the outcome.
             */
            nwc_parm_in( & return_event_name, & nwc_inout_dcb );
            res = ft_nwcleared(conn_id[DST], return_event_name,
                               & nwc_inout_dcb);
            if (res != SUCCESS)
               error_handler(nwc_inout_dcb-result, diag);
            /*
            **   Free memory.
            */
            res = ft_dfdcb((Octet *)nwc_inout_dcb, & outcome);
            if (res != SUCCESS)
               error_handler(outcome, diag);
         }
         else {
            error_handler(sda_inout_dcb-result,
                          sda_inout_dcb-diagnostic);
         }
      }
      /*   Free memory.
      */
      res = ft_dfdcb((Octet *)sda_inout_dcb, & outcome);
      if (res != SUCCESS)
         error_handler(outcome, diag);
   }
   /*
   **   Free memory.
   */
   res = ft_dfdcb((Octet *)rda_inout_dcb, & outcome);
   if (res != SUCCESS)
      error_handler(outcome, diag);
}
/*
**   Send a data end to the destination file.
**
**   Get the parameters for ft_edata.
**   Call ft_edata and verify the outcome.
*/
eda_parm_in(& return_event_name, & eda_input_dcb, & eda_inout_dcb);
res = ft_edata(conn_id[DST], return_event_name, eda_input_dcb,
               & eda_inout_dcb);
if (res != SUCCESS)
   error_handler(eda_inout_dcb-result, eda_inout_dcb-diagnostic);
```

```
/*
**   Free memory.
*/
res = ft_dfdcb((Octet *)eda_input_dcb, & outcome);
if (res != SUCCESS)
   error_handler(outcome, diag);
res = ft_dfdcb((Octet *)eda_inout_dcb, & outcome);
if (res != SUCCESS)
   error_handler(outcome, diag);
/*
**   End the transfer of data to the source and destination files.
**
**   Get the parameters for ft_etransfer.
**   Call ft_etransfer and verify the outcome.
*/
(void)printf("Ending data transfer for the source file");
(void)printf(" &  the destination file...\n");
for (i = 0; i %< TWO_CONNECTIONS; ++i) {
    etr_parm_in( & return_event_name, & etr_input_dcb, & etr_inout_dcb );
    res = ft_etransfer(conn_id[i], return_event_name, etr_input_dcb,
                       & etr_inout_dcb);
    if (res != SUCCESS)
       error_handler(etr_inout_dcb-result, etr_inout_dcb-diagnostic);
    /*
    **   Free memory.
    */
    res = ft_dfdcb((Octet *)etr_inout_dcb, & outcome);
    if (res != SUCCESS)
       error_handler(outcome, diag);
}
/*
**   Perform a grouped activity on the source and destination files.
**   ft_bgroup
**      ft_close
**      ft_deselect
**   ft_egroup
**
**   Get the parameters for ft_bgroup.
**   Call ft_bgroup and verify the outcome.
*/
(void)printf("Closing and deselecting the source file");
(void)printf(" &  the destination file...\n");
for (i = 0; i %< TWO_CONNECTIONS; ++i) {
    bgr_parm_in( & threshold, & return_event_name, & bgr_input_dcb,
                 & bgr_inout_dcb );
    res = ft_bgroup(conn_id[i], threshold, return_event_name,
                    bgr_input_dcb, & bgr_inout_dcb);
    if (res != SUCCESS)
       error_handler(bgr_inout_dcb-result, diag);
    /*
    **   Get the parameters for ft_close.
    **   Call ft_close and verify the outcome.
    */
    clo_parm_in( & return_event_name, & clo_input_dcb, & clo_inout_dcb );
    res = ft_close(conn_id[i], return_event_name, clo_input_dcb,
                   & clo_inout_dcb);
    if (res != SUCCESS)
       error_handler(clo_inout_dcb-result, clo_inout_dcb-diagnostic);
```

```
        /*   Get the parameters for ft_deselect.
        **   Call ft_deselect and verify the outcome.
        */
        des_parm_in( & return_event_name, & des_input_dcb, & des_inout_dcb );
        res = ft_deselect(conn_id[i], return_event_name, des_input_dcb,
                          & des_inout_dcb);
        if (res != SUCCESS)
           error_handler(des_inout_dcb-result, des_inout_dcb-diagnostic);
        /*
        **   Get the parameters for ft_egroup.
        **   Call ft_egroup and verify the outcome.
        */
        egr_parm_in( & return_event_name, & egr_input_dcb, & egr_inout_dcb );
        res = ft_egroup(conn_id[i], return_event_name, egr_input_dcb,
                        & egr_inout_dcb);
        if (res != SUCCESS)
           error_handler(egr_inout_dcb-result, diag);
        /*
        **   Wait on the asynchronous events in the group.
        */
        for (j = 1; j %<= 3; ++j) {
          wait_parm_in( & time, & result );
          res = em_wait(time, & return_event_name, & result);
          if (res != SUCCESS)
             error_handler(result, diag);
          switch (return_event_name) {
            case 1:
              if (bgr_inout_dcb-result.return_code != SUCCESS)
                 error_handler(bgr_inout_dcb-result, diag);
              break;
            case 2:
              if (clo_inout_dcb-result.return_code != SUCCESS)
                 error_handler(clo_inout_dcb-result,
                               clo_inout_dcb-diagnostic);
              break;
            case 3:
              if (des_inout_dcb-result.return_code != SUCCESS)
                 error_handler(des_inout_dcb-result,
                               des_inout_dcb-diagnostic);
              break;
            default:
              break;
          }
        }
        /*
        **   Free memory.
        */
        res = ft_dfdcb((Octet *)bgr_inout_dcb, & outcome);
        if (res != SUCCESS)
           error_handler(outcome, diag);
        res = ft_dfdcb((Octet *)clo_inout_dcb, & outcome);
        if (res != SUCCESS)
           error_handler(outcome, diag);
        res = ft_dfdcb((Octet *)des_inout_dcb, & outcome);
        if (res != SUCCESS)
           error_handler(outcome, diag);
        res = ft_dfdcb((Octet *)egr_inout_dcb, & outcome);
        if (res != SUCCESS)
           error_handler(outcome, diag);
    }
```

```
        /*
        **   Release the connections between ftam_init and the
        **   responders for the source file and the destination file.
        **
        **   Get the parameters for ft_rrequest.
        **   Call ft_rrequest and verify the outcome.
        */
        (void)printf("Releasing connections...\n");
        for (i = 0; i %< TWO_CONNECTIONS; ++i) {
            rre_parm_in( & return_event_name, & rre_input_dcb, & rre_inout_dcb );
            res = ft_rrequest(conn_id[i], return_event_name, rre_input_dcb,
                              & rre_inout_dcb);
            if (res != SUCCESS)
               error_handler(rre_inout_dcb-result, diag);
            /*
            **   Free memory.
            */
            res = ft_dfdcb((Octet *)rre_inout_dcb, & outcome);
            if (res != SUCCESS)
               error_handler(outcome, diag);
        }
        /*
        **   Deactivate ftam_init
        **
        **   Get the parameters for ft_aedeactivation.
        **   Call ft_aedeactivation and verify the outcome.
        */
        (void)printf("Deactivating ftam_init...\n");
        aed_parm_in( & return_event_name, & aed_inout_dcb );
        res = ft_aedeactivation(ae_label, return_event_name, & aed_inout_dcb);
        if (res != SUCCESS)
           error_handler(aed_inout_dcb-result, diag);
        /*
        **   Free memory.
        */
        res = ft_dfdcb((Octet *)aed_inout_dcb, & outcome);
        if (res != SUCCESS)
           error_handler(outcome, diag);
        (void)printf("ftm_llcopy: finished\n");
        return(SUCCESS);
    }
```

```
#include %</opt/ftam/include/map.h>
#include %</opt/ftam/include/mapftam.h>
#include “ftm_globs.h”
#include %<stdio.h>
#include %<malloc.h>
/*
**
**                              aea_parm_in
**
**  DESCRIPTION:
**    This routine assigns valid values to the ft_aeactivation
**    program.
**
**
**  PARAMETERS:
**    OUTPUT:
**      my_ae_name :           the ftam_init name of the user
**      return_event_name :    gets signalled when the event completes
**                             default:  SYNCHRONOUS
**      input_dcb :            contains authentication field
**      inout_dcb :            contains return_code field
**      ae_label :             AE invocation identifier
**
**
*/
void
aea_parm_in(my_ae_name, return_event_name, input_dcb, inout_dcb,
          ae_label)
Ae_dir_name                 *my_ae_name;
Local_event_name            *return_event_name;
struct Ft_aeactivate_in_dcb  **input_dcb;
struct Ft_output            **inout_dcb;
Ae_label                    *ae_label;
{
     /*
     **   Initialize my_ae_name identifying the local ftam_init.
     */
     convert_ddn(my_ae_name, LOCAL_INIT);
     *return_event_name = SYNCHRONOUS;
     /*
     **  Initialize input_dcb.
     */
     *input_dcb = (struct Ft_aeactivate_in_dcb *)malloc
          (sizeof(struct Ft_aeactivate_in_dcb));
     (*input_dcb)-authentication.pointer = (Octet *)NULL;
     (*input_dcb)-authentication.length = 0;
      (*input_dcb)-my_ae_title_option = No_value_option;
      (*input_dcb)-my_ae_title = NULL;
```

```
/*
     This is an example for setting the ae_title
*/
/*
     (*input_dcb)-my_ae_title_option = User_object_id_option;
     (*input_dcb)-my_ae_title = (struct Ae_title *)malloc
                    (sizeof(struct Object_id));
     (*input_dcb)-my_ae_title-ae_object_id.length = 6;
     (*input_dcb)-my_ae_title-ae_object_id.element = (Sint32 *)malloc
                    (6*sizeof(Sint32));
     (*input_dcb)-my_ae_title-ae_object_id.element[0] = 1;
     (*input_dcb)-my_ae_title-ae_object_id.element[1] = 3;
     (*input_dcb)-my_ae_title-ae_object_id.element[2] = 9999;
     (*input_dcb)-my_ae_title-ae_object_id.element[3] = 1;
     (*input_dcb)-my_ae_title-ae_object_id.element[4] = 7;
     (*input_dcb)-my_ae_title-ae_object_id.element[5] = 7;
*/
     *inout_dcb = NULL;
     *ae_label = 0;
}
/*
**
**                              con_parm_in
**
**  DESCRIPTION:
**    This routine assigns valid values to the ft_connect parameters.
**
**
**  PARAMETERS:
**    OUTPUT:
**      return_event_name :    gets signalled when the event completes
**                             default:  SYNCHRONOUS
**      called_ae_name :       the AE name of the responder
**      input_dcb :            contains ft_connect input information
**      inout_dcb :            contains return_code field
**      connection_id :        identifies the connection established
**
**
*/
void
con_source_parm_in(return_event_name, called_ae_name, input_dcb, inout_dcb,
             connection_id)
Local_event_name             *return_event_name;
Ae_dir_name                  *called_ae_name;
struct Ft_connect_in_dcb     **input_dcb;
struct Ft_connect_out_dcb    **inout_dcb;
Connection_id                *connection_id;
{
```

```
Return_code                 res;
Api_rc                      outcome;
struct Ft_diagnostic        *diag = NULL;
     /*
     **   Initialize the parameters with valid values.
     */
     *return_event_name = SYNCHRONOUS;
     /*
     **   Initialize the called_ae_name as the DDN identifying the
     **   responder.
     */
     convert_ddn(called_ae_name, LOCAL_RESP);
     /*
     **   Initialize the input_dcb.
     */
     res = ft_didcb(FTiConnect, 0, (Octet **)input_dcb, & outcome);
     if (res != SUCCESS)
        error_handler(outcome, diag);
     /*
     **   Set up the presentation address.
     **
     **   Note: Only the called_ae_dirname OR the called_presentation_address
     **         is needed. Both are set up for example purposes only.
     */
     /*    convert_paddr( & ((*input_dcb)-called_presentation_address),
                 “0102.0102.0102.490003080009011E20FE00” ); */
     /*
     **   Set up the called_ae_title.
     */
     /* 6-5-91 MCK:
      *        Changed to supply AP-title.
      */
     (*input_dcb)-called_ae_title_option = User_object_id_option;
     (*input_dcb)-called_ae_title = (struct Object_id *)malloc
                  (sizeof(struct Object_id));
     (*input_dcb)-called_ae_title-ae_object_id.length = 5;
     (*input_dcb)-called_ae_title-ae_object_id.element = (Sint32 *)malloc
                  (5*sizeof(Sint32));
     (*input_dcb)-called_ae_title-ae_object_id.element[0] = 1;
     (*input_dcb)-called_ae_title-ae_object_id.element[1] = 3;
     (*input_dcb)-called_ae_title-ae_object_id.element[2] = 9999;
     (*input_dcb)-called_ae_title-ae_object_id.element[3] = 1;
     (*input_dcb)-called_ae_title-ae_object_id.element[4] = 7;
     /*
     **   Set up the invoke ids.
     */
     (*input_dcb)-called_ae_invoke_id = NO_VALUE;
     (*input_dcb)-called_ap_invoke_id = NO_VALUE;
     /*
     **   Set up the retry counters and timer.
     */
     (*input_dcb)-number_of_retry = 0;
     (*input_dcb)-delay_between_retry = 0;
     (*input_dcb)-connection_resource_wait_timer = 0;
```

```
        /*
        **   Set up the context_name for FTAM.
        */
        (*input_dcb)-context_name.element = (Sint32 *)malloc(5*sizeof(Sint32));
        (*input_dcb)-context_name.length = 5;
        (*input_dcb)-context_name.element[0] = 1;
        (*input_dcb)-context_name.element[1] = 0;
        (*input_dcb)-context_name.element[2] = 8571;
        (*input_dcb)-context_name.element[3] = 1;
        (*input_dcb)-context_name.element[4] = 1;
        /*
        **   Set up the service_class, functional_units, and attribute_groups.
        */
        (*input_dcb)-connect_in_info.service_class = SERVICE_CLASS;
        (*input_dcb)-connect_in_info.functional_units = FUNCTIONAL_UNITS;
        (*input_dcb)-connect_in_info.attribute_groups = ATTRIBUTE_GROUPS;
        /*
        **   Set up the quality of service.
        */
        (*input_dcb)-connect_in_info.quality_of_service = FT_NO_RECOVERY;
        /*
        **   Set up the contents_type_list for FTAM-3 document type.
        */
        (*input_dcb)-connect_in_info.contents_type_list =
             (struct Ft_contents_type_element *)malloc
             (sizeof(struct Ft_contents_type_element));
        (*input_dcb)-connect_in_info.contents_type_list-next_element = NULL;
        ftam_3( & ((*input_dcb)-connect_in_info.
                   contents_type_list-contents_type) );
        /*
        **   Set up the initiator_id, account, and file_store_pw.
        */
        (*input_dcb)-connect_in_info.initiator_identity = DEST_ID;
        (*input_dcb)-connect_in_info.file_store_pw.length = DEST_PW_LEN;
        (*input_dcb)-connect_in_info.file_store_pw.pointer = (Octet *)DEST_PW;
        (*input_dcb)-connect_in_info.account = DEST_ACCOUNT;
        /*
        **   Initialize “inout_dcb”.
        */
        *inout_dcb = NULL;
        *connection_id = 0;
}
```

```
void
con_parm_in(return_event_name, called_ae_name, input_dcb, inout_dcb,
            connection_id)
Local_event_name             *return_event_name;
Ae_dir_name                  *called_ae_name;
struct Ft_connect_in_dcb     **input_dcb;
struct Ft_connect_out_dcb    **inout_dcb;
Connection_id                *connection_id;
{
Return_code                  res;
Api_rc                       outcome;
struct Ft_diagnostic         *diag = NULL;
     /*
     **   Initialize the parameters with valid values.
     */
     *return_event_name = SYNCHRONOUS;
     /*
     **   Initialize the called_ae_name as the DDN identifying the
     **   responder.
     */
     convert_ddn(called_ae_name, REMOTE_RESP);
     /*
     **   Initialize the input_dcb.
     */
     res = ft_didcb(FTiConnect, 0, (Octet **)input_dcb, & outcome);
     if (res != SUCCESS)
        error_handler(outcome, diag);
     /*
     **   Set up the presentation address.
     **
     **   Note: Only the called_ae_dirname OR the called_presentation_address
     **         is needed. Both are set up for example purposes only.
     */
/*    convert_paddr( & ((*input_dcb)-called_presentation_address),
                  “0102.0102.0102.490003080009011E20FE00” ); */
     /*
     **   Set up the called_ae_title.
     */
     /* 6-5-91 MCK:
      *        Changed to supply AP-title.
      */
     (*input_dcb)-called_ae_title_option = User_object_id_option;
     (*input_dcb)-called_ae_title = (struct Object_id *)malloc
                  (sizeof(struct Object_id));
     (*input_dcb)-called_ae_title-ae_object_id.length = 5;
     (*input_dcb)-called_ae_title-ae_object_id.element = (Sint32 *)malloc
                  (5*sizeof(Sint32));
     (*input_dcb)-called_ae_title-ae_object_id.element[0] = 1;
     (*input_dcb)-called_ae_title-ae_object_id.element[1] = 3;
     (*input_dcb)-called_ae_title-ae_object_id.element[2] = 9999;
     (*input_dcb)-called_ae_title-ae_object_id.element[3] = 1;
     (*input_dcb)-called_ae_title-ae_object_id.element[4] = 7;
```

```
/*
**   Set up the invoke ids.
*/
(*input_dcb)-called_ae_invoke_id = NO_VALUE;
(*input_dcb)-called_ap_invoke_id = NO_VALUE;
/*
**   Set up the retry counters and timer.
*/
(*input_dcb)-number_of_retry = 0;
(*input_dcb)-delay_between_retry = 0;
(*input_dcb)-connection_resource_wait_timer = 0;
/*
**   Set up the context_name for FTAM.
*/
(*input_dcb)-context_name.element = (Sint32 *)malloc(5*sizeof(Sint32));
(*input_dcb)-context_name.length = 5;
(*input_dcb)-context_name.element[0] = 1;
(*input_dcb)-context_name.element[1] = 0;
(*input_dcb)-context_name.element[2] = 8571;
(*input_dcb)-context_name.element[3] = 1;
(*input_dcb)-context_name.element[4] = 1;
/*
**   Set up the service_class, functional_units, and attribute_groups.
*/
(*input_dcb)-connect_in_info.service_class = FT_SC_UNCONSTRAINED
                                | FT_SC_MANAGEMENT | FT_SC_TRANSFER
                                | FT_SC_TRANSFER_AND_MGMT | FT_SC_ACCESS;
(*input_dcb)-connect_in_info.functional_units = FT_FU_READ | FT_FU_WRITE
              | FT_FU_FILE_ACCESS | FT_FU_LTD_MGMT
              | FT_FU_ENH_MGMT | FT_FU_GROUPING;
/* (*input_dcb)-connect_in_info.attribute_groups = FT_AG_STORAGE
                                | FT_AG_SECURITY | FT_AG_PRIVATE; */
(*input_dcb)-connect_in_info.attribute_groups = FT_AG_STORAGE
                                | FT_AG_PRIVATE;
/*
**   Set up the quality of service.
*/
(*input_dcb)-connect_in_info.quality_of_service = FT_NO_RECOVERY;
/*
**   Set up the contents_type_list for FTAM-3 document type.
*/
(*input_dcb)-connect_in_info.contents_type_list =
     (struct Ft_contents_type_element *)malloc
     (sizeof(struct Ft_contents_type_element));
(*input_dcb)-connect_in_info.contents_type_list-next_element = NULL;
ftam_3( & ((*input_dcb)-connect_in_info.
           contents_type_list-contents_type) );
/*
**   Set up the initiator_id, account, and file_store_pw.
*/
(*input_dcb)-connect_in_info.initiator_identity = DEST_ID;
(*input_dcb)-connect_in_info.file_store_pw.length = DEST_PW_LEN;
(*input_dcb)-connect_in_info.file_store_pw.pointer = (Octet *)DEST_PW;
(*input_dcb)-connect_in_info.account = DEST_ACCOUNT;
```

```
     /*
     **   Initialize “inout_dcb”.
     */
     *inout_dcb = NULL;
     *connection_id = 0;
}
/*
**
**                              rre_parm_in
**
**  DESCRIPTION:
**    This routine assigns valid values to the ft_rrequest parameters.
**
**
**  PARAMETERS:
**    OUTPUT:
**      return_event_name :    gets signalled when the event completes
**                             default:  SYNCHRONOUS
**      input_dcb :            input_dcb is NULL
**      inout_dcb :            contains return_code field
**
**
*/
void
rre_parm_in(return_event_name, input_dcb, inout_dcb)
Local_event_name             *return_event_name;
struct Ft_relreq_in_dcb      **input_dcb;
struct Ft_relreq_out_dcb     **inout_dcb;
{
     /*
     **   Initialize the parameters with valid values.
     */
     *return_event_name = SYNCHRONOUS;
     *input_dcb = NULL;
     *inout_dcb = NULL;
}
/*
**
**                              aed_parm_in
**
**  DESCRIPTION:
**    This routine assigns valid values to the ft_aedeactivation parameters.
**
**
**  PARAMETERS:
**    OUTPUT:
**      return_event_name :    gets signalled when the event completes
**                             default:  SYNCHRONOUS
**      inout_dcb :            contains return_code field
**
**
*/
```

```
void
aed_parm_in(return_event_name, inout_dcb)
Local_event_name             *return_event_name;
struct Ft_output             **inout_dcb;
{
     /*
     **   Initialize the parameters with valid values.
     */
     *return_event_name = SYNCHRONOUS;
     *inout_dcb = NULL;
}
/*
**                        fco_parm_in
**
**  DESCRIPTION:
**    This routine assigns valid values to the ft_fcopy parameters.
**
**
**  PARAMETERS:
**    Outputs:
**      source_dirname :              name of the source AE directory
**      source_filename :             name of the source file
**      destination_dirname :         name of the destination AE directory
**      destination_filename :        name of the destination file
**      ae_label :                    label of AE invocation
**      return_event_name :           gets signalled when the event completes
**                                    default:  SYNCHRONOUS
**      input_dcb :                   contains ft_fcopy input information
**      inout_dcb :                   contains return_code field
**
*/
void
fco_parm_in(source_dirname, source_filename, destination_dirname,
             destination_filename, ae_label, return_event_name, input_dcb,
             inout_dcb)
Ae_dir_name                      *source_dirname;
Ft_filename                      *source_filename;
Ae_dir_name                      *destination_dirname;
Ft_filename                      *destination_filename;
Ae_label                         *ae_label;
Local_event_name                 *return_event_name;
struct Ft_fcopy_in_dcb           **input_dcb;
struct Ft_fcopy_out_dcb          **inout_dcb;
{
Return_code                      res;
Api_rc                           outcome;
struct Ft_diagnostic             *diag = NULL;
```

```
        /*
        **   Set the directory distinguished names to identify the
        **   responders on the source and destination nodes.
        */
        convert_ddn(source_dirname, LOCAL_RESP);
        convert_ddn(destination_dirname, REMOTE_RESP);
        /*
        **   Initialize the filenames.
        */
        *source_filename = SRC_FNAME;
        *destination_filename = DEST_FNAME;
        *ae_label = NULL;
        *return_event_name = SYNCHRONOUS;
        /*
        **   Initialize the input_dcb.
        */
        res = ft_didcb(FTiFCopy, 0, (Octet **)input_dcb, & outcome);
        if (res != SUCCESS)
           error_handler(outcome, diag);
        (*input_dcb)-source_init_id = SRC_ID;
        (*input_dcb)-source_filestore_pw.pointer = (Octet *)SRC_PW;
        (*input_dcb)-source_filestore_pw.length = SRC_PW_LEN;
        (*input_dcb)-source_account = SRC_ACCOUNT;
        passwords_in( & ((*input_dcb)-source_file_passwords) );
        (*input_dcb)-dest_init_id = DEST_ID;
        (*input_dcb)-dest_filestore_pw.pointer = (Octet *)DEST_PW;
        (*input_dcb)-dest_filestore_pw.length = DEST_PW_LEN;
        (*input_dcb)-dest_account = DEST_ACCOUNT;
        passwords_in( & ((*input_dcb)-dest_file_passwords) );
        (*input_dcb)-create_file_pw.pointer = (Octet *)CREAT_PW;
        (*input_dcb)-create_file_pw.length = CREAT_PW_LEN;
        (*input_dcb)-overwrite = FT_RECREATE_FILE;
        /*
        **   Initialize the inout_dcb.
        */
        *inout_dcb = NULL;
}
```

```
/*
**
**                              fca_parm_in
**
**  DESCRIPTION:
**    This routine assigns valid values to the ft_fcattributes parameters.
**
**
**  PARAMETERS:
**    Outputs:
**      dirname :               name of the AE directory
**      filename :              name of the file
**      ae_label :              label of AE invocation
**      return_event_name :     gets signalled when the event completes
**                              default:  SYNCHRONOUS
**      input_dcb :             contains ft_fcattributes input information
**      inout_dcb :             contains return_code field
**
*/
void
fca_parm_in(dirname, filename, ae_label, return_event_name, input_dcb,
            inout_dcb)
Ae_dir_name                      *dirname;
Ft_filename                      *filename;
Uint32                           *ae_label;
Local_event_name                 *return_event_name;
struct Ft_fcattributes_in_dcb    **input_dcb;
struct Ft_fcattributes_out_dcb   **inout_dcb;
{
Return_code                       res;
Api_rc                            outcome;
struct Ft_diagnostic              *diag = NULL;
     /*
     **   Set the directory distinguished name to identify the responder
     **   on the desired node.
     */
     convert_ddn(dirname, REMOTE_RESP);
     *filename = DEST_FNAME;
     *ae_label = 0;
     *return_event_name = SYNCHRONOUS;
     /*
     **   Initialize the input_dcb.
     */
     res = ft_didcb(FTiFCattributes, 0, (Octet **)input_dcb, & outcome);
     if (res != SUCCESS)
        error_handler(outcome, diag);
     (*input_dcb)-init_id = DEST_ID;
     (*input_dcb)-filestore_pw.pointer = (Octet *)DEST_PW;
     (*input_dcb)-filestore_pw.length = DEST_PW_LEN;
     passwords_in( & ((*input_dcb)-file_passwords) );
```

```
     /*
     **   Set up the changed attributes.
     */
     (*input_dcb)-attribute_names |= FT_AN_STORAGE_ACCT
                   | FT_AN_FILE_AVAILABILITY | FT_AN_FUTURE_FILESIZE
                   | FT_AN_LEGAL_QUAL
                   | FT_AN_PRIVATE_USE;
     cat_attribute_in( & ((*input_dcb)-attributes) );
     (*input_dcb)-account = DEST_ACCOUNT;
     /*
     **   Initialize the inout_dcb.
     */
     *inout_dcb = NULL;
}
/*
**
**                              fde_parm_in
**
**  DESCRIPTION:
**    This routine assigns valid values to the ft_fdelete parameters.
**
**
**  PARAMETERS:
**    Outputs:
**      dirname :              name of the AE directory
**      filename :             name of the file
**      ae_label :             label of AE invocation
**      return_event_name :    gets signalled when the event completes
**                             default:  SYNCHRONOUS
**      input_dcb :            contains ft_fdelete input information
**      inout_dcb :            contains return_code field
**
*/
void
fde_parm_in(dirname, filename, ae_label, return_event_name, input_dcb,
            inout_dcb)
Ae_dir_name                     *dirname;
Ft_filename                     *filename;
Uint32                          *ae_label;
Local_event_name                *return_event_name;
struct Ft_fdelete_in_dcb        **input_dcb;
struct Ft_fdelete_out_dcb       **inout_dcb;
{
Return_code                     res;
Api_rc                          outcome;
struct Ft_diagnostic            *diag = NULL;
     /*
     **   Set the directory distinguished name to identify the desired
     **   responder.
     */
     convert_ddn(dirname, LOCAL_RESP);
     *filename = SRC_FNAME;
     *ae_label = 0;
     *return_event_name = SYNCHRONOUS;
```

```
      /*
      **   Initialize the input_dcb.
      */
      res = ft_didcb(FTiFDelete, 0, (Octet **)input_dcb, & outcome);
      if (res != SUCCESS)
         error_handler(outcome, diag);
      (*input_dcb)-init_id = SRC_ID;
      (*input_dcb)-filestore_pw.pointer = (Octet *)SRC_PW;
      (*input_dcb)-filestore_pw.length = SRC_PW_LEN;
      (*input_dcb)-delete_file_pw.pointer = (Octet *)DEL_PW;
      (*input_dcb)-delete_file_pw.length = DEL_PW_LEN;
      (*input_dcb)-account = DEST_ACCOUNT;
      /*
      **   Initialize the inout_dcb.
      */
      *inout_dcb = NULL;
}
/*
**
**                              sel_parm_in
**
**  DESCRIPTION:
**    This routine assigns valid values to the ft_select parameters.
**
**
**  PARAMETERS:
**    Outputs:
**      filename :              name of the file to select
**      requested_access :      requested file action
**      return_event_name :     gets signalled when the event completes
**                              default:  SYNCHRONOUS
**      input_dcb :             contains ft_select input information
**      inout_dcb :             contains return_code field
**
*/
void
sel_parm_in(filename, requested_access, return_event_name, input_dcb,
            inout_dcb)
Ft_filename                    *filename;
Ft_file_actions                *requested_access;
Local_event_name               *return_event_name;
struct Ft_select_in_dcb        **input_dcb;
struct Ft_select_out_dcb       **inout_dcb;
{
```

```
Api_rc                          outcome;
Return_code                     res;
struct Ft_diagnostic            *diag = NULL;
     /*
     **   Initialize the parameters with valid values.
     */
     *filename = SRC_FNAME;
     *requested_access = FT_FA_READ | FT_FA_REPLACE
                    | FT_FA_EXTEND | FT_FA_ERASE | FT_FA_READ_ATTRIBUTE
                    | FT_FA_CHANGE_ATTRIBUTE | FT_FA_DELETE_FILE;
     *return_event_name = 2;
     /*
     **  Initialize the input_dcb.
     */
     res = ft_didcb(FTiSelect, 0, (Octet **)input_dcb, & outcome);
     if (res != SUCCESS)
        error_handler(outcome, diag);
     attribute_in( & ((*input_dcb)-attributes) );
     passwords_in( & ((*input_dcb)-file_passwords) );
     (*input_dcb)-account = DEST_ACCOUNT;
     (*input_dcb)-concurrency_control = (struct Ft_concurrency_control *)
          malloc(sizeof(struct Ft_concurrency_control));
     concur_cntl_in( & ((*input_dcb)-concurrency_control) );
     /*
     **  Initialize the inout_dcb.
     */
     *inout_dcb = NULL;
}

/*
**
**                              des_parm_in
**
**  DESCRIPTION:
**    This routine assigns valid values to the ft_deselect parameters.
**
**
**  PARAMETERS:
**    Outputs:
**      return_event_name :     gets signalled when the event completes
**                              default:  SYNCHRONOUS
**      input_dcb :             input_dcb is NULL
**      inout_dcb :             contains return_code field
**
*/
void
des_parm_in(return_event_name, input_dcb, inout_dcb)
Local_event_name                *return_event_name;
char                            **input_dcb;
struct Ft_deselect_out_dcb      **inout_dcb;
{
```

```
     /*
     **   Initialize the parameters with valid values.
     */
     *return_event_name = 3;
     *input_dcb = NULL;
     *inout_dcb = NULL;
}
/*
**
**                              rat_parm_in
**
**  DESCRIPTION:
**    This routine assigns valid values to the ft_rattributes parameters.
**
**
**  PARAMETERS:
**    Outputs:
**      return_event_name :    gets signalled when the event completes
**                             default:  SYNCHRONOUS
**      input_dcb :            contains Ft_attributes_name field
**      inout_dcb :            contains return_code field
**
*/
void
rat_parm_in(return_event_name, input_dcb, inout_dcb)
Local_event_name               *return_event_name;
struct Ft_rattributes_in_dcb   **input_dcb;
struct Ft_rattributes_out_dcb  **inout_dcb;
{
Api_rc                         outcome;
Return_code                    res;
struct Ft_diagnostic           *diag = NULL;
     /*
     **   Initialize the parameters with valid values.
     */
     *return_event_name = 3;
     res = ft_didcb(FTiReadattributes, 0, (Octet **)input_dcb, & outcome);
     if (res != SUCCESS)
        error_handler(outcome, diag);
     (*input_dcb)-attribute_names = FT_AN_PERMITTED_ACTIONS
                  | FT_AN_CONTENT_TYPE
                  | FT_AN_ID_OF_CREATOR
                  | FT_AN_ACCESS_CONTROL;
     *inout_dcb = NULL;
}
```

```
/*
**
**                              ope_parm_in
**
**  DESCRIPTION:
**    This routine assigns valid values to the ft_open parameters.
**
**
**  PARAMETERS:
**    Outputs:
**      processing_mode :      type of permission
**      contents_type :        document type
**      return_event_name :    gets signalled when the event completes
**                             default:  SYNCHRONOUS
**      input_dcb :            contains ft_open input information
**      inout_dcb :            contains return_code field
**
*/
void
ope_parm_in(processing_mode, contents_type, return_event_name,
            input_dcb, inout_dcb)
Ft_processing_mode             *processing_mode;
struct Ft_contents_type        *contents_type;
Local_event_name               *return_event_name;
struct Ft_open_in_dcb          **input_dcb;
struct Ft_open_out_dcb         **inout_dcb;
{
Api_rc                         outcome;
Return_code                    res;
struct Ft_diagnostic           *diag = NULL;

    /*
     **   Initialize the parameters with valid values.
     */
     *processing_mode = FT_PM_READ | FT_PM_REPLACE
                      | FT_PM_EXTEND | FT_PM_ERASE;
     ftam_3(contents_type);
     *return_event_name = SYNCHRONOUS;
     /*
     **   Initialize the input_dcb.
     */
     res = ft_didcb(FTiOpen, 0, (Octet **)input_dcb, & outcome);
     if (res != SUCCESS)
        error_handler(outcome, diag);
     (*input_dcb)-concurrency_control = (struct Ft_concurrency_control *)
        malloc(sizeof(struct Ft_concurrency_control));
     concur_cntl_in( & ((*input_dcb)-concurrency_control) );
     /*
     **   Initialize the inout_dcb.
     */
     *inout_dcb = NULL;
}
```

```
/*
**
**                              clo_parm_in
**
**  DESCRIPTION:
**    This routine assigns valid values to the ft_close parameters.
**
**  PARAMETERS:
**    Outputs:
**      return_event_name :     gets signalled when the event completes
**                              default:  SYNCHRONOUS
**      input_dcb :             input_dcb is NULL
**      inout_dcb :             contains return_code field
*/
void
clo_parm_in(return_event_name, input_dcb, inout_dcb)
Local_event_name              *return_event_name;
char                          **input_dcb;
struct Ft_close_out_dcb       **inout_dcb;
{
     /*
     **   Initialize the parameters with all valid values.
     */
     *return_event_name = 2;
     *input_dcb = NULL;
     *inout_dcb = NULL;
}
/*
**
**                              cre_parm_in
**
**  DESCRIPTION:
**    This routine assigns valid values to the ft_create parameters.
**
**  PARAMETERS:
**    Outputs:
**      filename :              name of file to create
**      contents_type :         type of document
**      requested_access :      type of file access
**      file_status :           state of the file
**      return_event_name :     gets signalled when the event completes
**                              default:  SYNCHRONOUS
**      input_dcb :             contains ft_create input information
**      inout_dcb :             contains return_code field
*/
void
cre_parm_in(filename, contents_type, requested_access, file_status,
            return_event_name, input_dcb, inout_dcb)
Ft_filename                     *filename;
struct Ft_contents_type         *contents_type;
Ft_file_actions                 *requested_access;
enum Ft_file_status             *file_status;
Local_event_name                *return_event_name;
struct Ft_create_in_dcb         **input_dcb;
struct Ft_create_out_dcb        **inout_dcb;
{
```

```
Api_rc                          outcome;
Return_code                     res;
struct Ft_diagnostic            *diag = NULL;
     /*
     **   Initialize the parameters with valid values.
     */
     *filename = DEST_FNAME;
     ftam_3(contents_type);
     *requested_access = FT_FA_READ | FT_FA_REPLACE
                  | FT_FA_EXTEND | FT_FA_ERASE | FT_FA_READ_ATTRIBUTE
                  | FT_FA_CHANGE_ATTRIBUTE | FT_FA_DELETE_FILE;
     *file_status = FT_NEW;
     *return_event_name = 2;
     /*
     **  Initialize the input_dcb.
     */
     res = ft_didcb(FTiCreate, 0, (Octet **)input_dcb, & outcome);
     if (res != SUCCESS)
        error_handler(outcome, diag);
     (*input_dcb)-concurrency_control = (struct Ft_concurrency_control *)
          malloc(sizeof(struct Ft_concurrency_control));
     concur_cntl_in( & ((*input_dcb)-concurrency_control) );
     (*input_dcb)-create_file_pw.pointer = (Octet *)CREAT_PW;
     (*input_dcb)-create_file_pw.length = CREAT_PW_LEN;
     passwords_in( & ((*input_dcb)-file_passwords) );
     (*input_dcb)-account = DEST_ACCOUNT;
     /*
     **   Initialize the inout_dcb.
     */
     *inout_dcb = NULL;
}
/*
**                              bgr_parm_in
**  DESCRIPTION:
**    This routine assigns valid values to the ft_bgroup parameters.
**
**  PARAMETERS:
**    Outputs:
**      threshold :             number of calls within the group
**      return_event_name :     gets signalled when the event completes
**                              default:  SYNCHRONOUS
**      input_dcb :             contains ft_bgroup input information
**      inout_dcb :             contains return_code field
*/
void
bgr_parm_in(threshold, return_event_name, input_dcb, inout_dcb)
Uint16                          *threshold;
Local_event_name                *return_event_name;
char                            **input_dcb;
struct Ft_bgroup_out_dcb        **inout_dcb;
{
```

```
     /*
     **   Initialize the parameters with all valid values.
     */
     *return_event_name = 1;
     *threshold = 2;
     *input_dcb = NULL;
     *inout_dcb = NULL;
}
/*
**
**                              egr_parm_in
**
**  DESCRIPTION:
**    This routine assigns valid values to the ft_egroup parameters.
**
**
**  PARAMETERS:
**    Outputs:
**      return_event_name :    gets signalled when the event completes
**                             default:  SYNCHRONOUS
**      input_dcb :            input_dcb is NULL
**      inout_dcb :            contains return_code field
**
*/
void
egr_parm_in(return_event_name, input_dcb, inout_dcb)
Local_event_name              *return_event_name;
char                          **input_dcb;
struct Ft_egroup_out_dcb      **inout_dcb;
{
     /*
     **   Initialize the parameters with valid values.
     */
     *return_event_name = SYNCHRONOUS;
     *input_dcb = NULL;
     *inout_dcb = NULL;
}
```

```
/*
**
**                              rea_parm_in
**
**  DESCRIPTION:
**    This routine assigns valid values to the ft_read parameters.
**
**
**  PARAMETERS:
**    Outputs:
**      fadu_identity :        FADU identifier
**      access_context :       file structure
**      return_event_name :    gets signalled when the event completes
**                             default:  SYNCHRONOUS
**      input_dcb :            input_dcb is NULL
**      inout_dcb :            contains return_code field
**
*/
void
rea_parm_in(fadu_identity, access_context, return_event_name, input_dcb,
            inout_dcb)
struct Ft_fadu_identity       *fadu_identity;
enum Ft_access_context        *access_context;
Local_event_name              *return_event_name;
char                          **input_dcb;
struct Ft_read_out_dcb        **inout_dcb;
{
     /*
     **   Initialize the parameters with valid values.
     */
     fadu_ident_in(fadu_identity);
     *access_context = FT_UNSTRUCTURED_ALL_DATA_UNITS;
     *return_event_name = SYNCHRONOUS;
     *input_dcb = NULL;
     *inout_dcb = NULL;
}
/*
**
**                              wri_parm_in
**
**  DESCRIPTION:
**    This routine assigns valid values to the ft_write parameters.
**
**  PARAMETERS:
**    Outputs:
**      fadu_identity :        FADU identifier
**      fadu_operation :       type of write to perform
**      return_event_name :    gets signalled when the event completes
**                             default:  SYNCHRONOUS
**      input_dcb :            input_dcb is NULL
**      inout_dcb :            contains return_code field
**
*/
void
wri_parm_in(fadu_identity, fadu_operation, return_event_name, input_dcb,
            inout_dcb)
```

```
struct Ft_fadu_identity       *fadu_identity;
enum Ft_fadu_operation        *fadu_operation;
Local_event_name              *return_event_name;
char                          **input_dcb;
struct Ft_write_out_dcb       **inout_dcb;
{
     /*
     **   Initialize the parameters with valid values.
     */
     fadu_ident_in(fadu_identity);
     *fadu_operation = FT_REPLACE;
     *return_event_name = SYNCHRONOUS;
     *input_dcb = NULL;
     *inout_dcb = NULL;
}
/*
**
**                              sda_parm_in
**
**  DESCRIPTION:
**    This routine assigns valid values to the ft_sdata parameters.
**
**
**  PARAMETERS:
**    Outputs:
**      return_event_name :    gets signalled when the event completes
**                             default:  SYNCHRONOUS
**      data_unit :            Actual data to send
**      inout_dcb :            contains return_code field
**
*/
void
sda_parm_in(return_event_name, inout_dcb)
Local_event_name              *return_event_name;
struct Ft_sdata_out_dcb       **inout_dcb;
{
     /*
     **   Initialize the parameters with valid values.
     */
     *return_event_name = SYNCHRONOUS;
     *inout_dcb = NULL;
}
```

```
/*
**
**                              rda_parm_in
**
**  DESCRIPTION:
**    This routine assigns valid values to the ft_rdata parameters.
**
**
**  PARAMETERS:
**    Outputs:
**      des_requested :         number of FADUs requested to receive
**      return_event_name :     gets signalled when the event completes
**                              default:  SYNCHRONOUS
**      inout_dcb :             contains return_code field
**
*/
void
rda_parm_in(des_requested, return_event_name, inout_dcb)
Local_event_name              *return_event_name;
Uint16                        *des_requested;
struct Ft_rdata_out_dcb       **inout_dcb;
{
     /*
     **   Initialize the parameters with valid values.
     */
     *des_requested = 10;
     *return_event_name = SYNCHRONOUS;
     *inout_dcb = NULL;
}
/*
**
**                              eda_parm_in
**
**  DESCRIPTION:
**    This routine assigns valid values to the ft_edata parameters.
**
**
**  PARAMETERS:
**    Outputs:
**      return_event_name :     gets signalled when the event completes
**                              default:  SYNCHRONOUS
**      input_dcb :             contains ft_edata input information
**      inout_dcb :             contains return_code field
**
*/
void
eda_parm_in(return_event_name, input_dcb, inout_dcb)
Local_event_name              *return_event_name;
struct Ft_edata_in_dcb        **input_dcb;
struct Ft_edata_out_dcb       **inout_dcb;
{
Api_rc                        outcome;
Return_code                   res;
struct Ft_diagnostic          *diag = NULL;
```

```
     /*
     **   Initialize the parameters with all valid values.
     */
     *return_event_name = SYNCHRONOUS;
     res = ft_didcb(FTiDataEnd, 0, (Octet **)input_dcb, & outcome);
     if (res != SUCCESS)
        error_handler(outcome, diag);
     (*input_dcb)-action_result = FT_AR_SUCCESS;
     (*input_dcb)-diagnostic = NULL;
     *inout_dcb = NULL;
}
/*
**
**                              etr_parm_in
**
**  DESCRIPTION:
**    This routine assigns valid values to the ft_etransfer parameters.
**
**
**  PARAMETERS:
**    Outputs:
**      return_event_name :    gets signalled when the event completes
**                             default:  SYNCHRONOUS
**      input_dcb :            contains ft_etransfer input information
**      inout_dcb :            contains return_code field
**
*/
void
etr_parm_in(return_event_name, input_dcb, inout_dcb)
Local_event_name              *return_event_name;
char                          **input_dcb;
struct Ft_etransfer_out_dcb   **inout_dcb;
{
     /*
     **   Initialize the parameters with all valid values.
     */
     *return_event_name = SYNCHRONOUS;
     *input_dcb = NULL;
     *inout_dcb = NULL;
}
```

```
/*
**
**                              wait_parm_in
**
**  DESCRIPTION:
**    This routine sets up the parameter values and the expected
**    outcome values for em_wait calls. This routine allows
**    the test programs to specify which set of parameter values
**    you want to set.
**
**
**  PARAMETERS:
**    OUTPUT:
**      time :                timeout value
**      result :              contains return_code field for em_wait
**
*/
void
wait_parm_in(time, result)
Em_t                          *time;
Api_rc                        *result;
{
     /*
     **   Initialize “time” to infinite.
     */
     *time = -1;
     /*
     **   Initialize “result”.
     */
     result-return_code = 9999;
     result-vendor_code = 9999;
}
/*
**
**                              passwords_in
**
**  DESCRIPTION:
**    This routine assigns valid values to the file_passwords structure.
**
**
**  PARAMETERS:
**    Outputs:
**      file_passwords :            pointer to the Ft_file_passwords structure
**
*/
void
passwords_in(file_passwords)
struct Ft_file_passwords               *file_passwords;
{
```

```
     /*
     **   Initialize all fields of the Ft_file_passwords structure.
     */
     file_passwords-read.length = 4;
     file_passwords-read.pointer = (Octet *)"read";
     file_passwords-insert.length = 6;
     file_passwords-insert.pointer = (Octet *)"insert";
     file_passwords-replace.length = 7;
     file_passwords-replace.pointer = (Octet *)"replace";
     file_passwords-extend.length = 6;
     file_passwords-extend.pointer = (Octet *)"extend";
     file_passwords-erase.length = 5;
     file_passwords-erase.pointer = (Octet *)"erase";
     file_passwords-read_attribute.length = 8;
     file_passwords-read_attribute.pointer = (Octet *)"readattr";
     file_passwords-change_attribute.length = 8;
     file_passwords-change_attribute.pointer = (Octet *)"chngattr";
     file_passwords-delete_file.length = 8;
     file_passwords-delete_file.pointer = (Octet *)"delefile";
}
/*
**
**                              cat_attribute_in
**
**  DESCRIPTION:
**    This routine assigns valid values to the Ft_attributes structure
**    for the ft_cattributes and ft_fcattributes calls.
**
**
**  PARAMETERS:
**    Outputs:
**      attributes :           pointer to the Ft_attributes structure
**
*/
void
cat_attribute_in(attributes)
struct Ft_attributes             *attributes;
{
     /*
     **   Initialize all fields in Ft_attributes structure.
     */
     attributes-mask = 0;
     /*
     **   Change the storage_account.
     */
     attributes-values.storage_account = STORAGE_ACCOUNT;
     /*
     **   Change the file_availability.
     */
     attributes-values.file_availability = FT_IMMEDIATE_AVAIL;
     /*
     **   Change the future_filesize.
     */
     attributes-values.future_filesize = 1000000;
```

```
     /*
     **   Change the legal_qualification.
     */
     attributes-values.legal_qualification = “I’m_bad”;
     /*
     **   Change the private_use.
     */
     attributes-values.private_use.pointer = (Octet *)“private”;
     attributes-values.private_use.length = 7;
}
/*
**
**                              ftam_3
**
**  DESCRIPTION:
**    This routine assigns a ftam_3 document type to the Ft_contents_type
**    structure.
**
**
**  PARAMETERS:
**    Outputs:
**      cont_type :                  pointer to the Ft_contents_type structure
**
*/
void
ftam_3(cont_type)
struct Ft_contents_type              *cont_type;
{
struct Ft_dt_ftam_3                  *ftm_3;
     /*
     **   Initialize all fields of the Ft_contents_type structure.
     */
     cont_type-contents_form = FT_DOCUMENT_TYPE;
     ftm_3 = (struct Ft_dt_ftam_3 *)malloc(sizeof(struct Ft_dt_ftam_3));
     cont_type-contents_info.document.name.element =
     (Sint32 *)malloc(5*sizeof(Sint32));
     ftm_3-string_length = 512;
     ftm_3-significance = FT_SS_NO_SIGNIFICANCE;
     cont_type-contents_info.document.parameters = (char *)ftm_3;
     cont_type-contents_info.document.name.length = 5;
     cont_type-contents_info.document.name.element[0]=1;
     cont_type-contents_info.document.name.element[1]=0;
     cont_type-contents_info.document.name.element[2]=8571;
     cont_type-contents_info.document.name.element[3]=5;
     cont_type-contents_info.document.name.element[4]=3;
}
```

```
/*
**
**                              attribute_in
**
**  DESCRIPTION:
**    This routine assigns valid values to the Ft_attribute structure.
**
**
**  PARAMETERS:
**    Outputs:
**      attributes :           pointer to the attributes structure
**
*/
void
attribute_in(attributes)
struct Ft_attributes             *attributes;
{
     /*
     **   Initialize all fields of Ft_attributes structure.
     */
     attributes-mask = FT_AN_FILENAME | FT_AN_PERMITTED_ACTIONS
                     | FT_AN_CONTENT_TYPE | FT_AN_STORAGE_ACCT
                     | FT_AN_ID_OF_CREATOR | FT_AN_ID_OF_MODIFIER
                     | FT_AN_ID_OF_READER | FT_AN_ID_OF_ATT_MOD
                     | FT_AN_FILE_AVAILABILITY | FT_AN_FUTURE_FILESIZE
                     | FT_AN_LEGAL_QUAL | FT_AN_PRIVATE_USE;
     attributes-values.filename = SRC_FNAME;
     attributes-values.permitted_actions = FT_PA_READ | FT_PA_REPLACE
                     | FT_PA_EXTEND | FT_PA_ERASE | FT_PA_READ_ATTRIBUTE
                     | FT_PA_CHANGE_ATTRIBUTE | FT_PA_DELETE_FILE;
     ftam_3( & (attributes-values.contents_type) );
     attributes-values.storage_account = STORAGE_ACCOUNT;
     attributes-values.identity_of_creator = CREAT_ID;
     attributes-values.access_control.delete_ace = NULL;
     attributes-values.access_control.insert_ace = NULL;
     attributes-values.file_availability = FT_DEFERRED_AVAIL;
     attributes-values.future_filesize = 1000;
     attributes-values.legal_qualification = "legal_qual";
     attributes-values.private_use.pointer = (Octet *)"private";
     attributes-values.private_use.length = 7;
}
```

```
/*
**
**                              concur_cntl_in
**
**  DESCRIPTION:
**    This routine assigns valid values to the Ft_concurrency_control
**    structure.
**
**
**  PARAMETERS:
**    Outputs:
**      concurrency_control :         pointer to the Ft_concurrency_control
**                                    structure
**
*/
void
concur_cntl_in(concurrency_control)
struct Ft_concurrency_control           **concurrency_control;
{
     /*
     **   Initialize the Ft_concurrency_control structure.
     */
     *concurrency_control = NULL;
}
/*
**
**                              fadu_ident_in
**
**  DESCRIPTION:
**    This routine assigns valid values to the Ft_fadu_identity structure.
**
**
**  PARAMETERS:
**    Outputs:
**      fadu_identity :       pointer to the Ft_fadu_identity structure
**
*/
void
fadu_ident_in(fadu_identity)
struct Ft_fadu_identity          *fadu_identity;
{
     /*
     **   Initialize all fields of Ft_fadu_identity structure.
     */
     fadu_identity-fadu_form = FT_FADU_LOCATION;
     fadu_identity-fadu_info.fadu_location = FT_FIRST;
}
```

```
/*
**
**                              nwc_parm_in
**
**  DESCRIPTION:
**    This routine assigns values to the ft_nwcleared parameters.
**
**
**  PARAMETERS:
**    OUTPUT:
**      return_event_name :    gets signalled when the event completes
**                             default:  SYNCHRONOUS
**      inout_dcb :            contains return_code field
**
**
*/
void
nwc_parm_in(return_event_name, inout_dcb)
Local_event_name                  *return_event_name;
struct Ft_nwcleared_out_dcb       **inout_dcb;
{
     /*
     **   Initialize the parameters with valid values.
     */
     *return_event_name = SYNCHRONOUS;
     *inout_dcb = NULL;
}
```

```
#include %</opt/ftam/include/map.h>
#include %</opt/ftam/include/mapftam.h>
#include %<stdio.h>
void exit();
/*
**                            error_handler
**
**   DESCRIPTION:
**     This routine is an example of handling failures experienced
**     during the FTAM functions. This routine will display the
**     error messages.
**
**  PARAMETERS:
**    INPUT:
**      result :              the MAP and HP error information
**      diag :                the ISO error information
**
*/
void
error_handler(result, diag)
Api_rc                          result;
struct Ft_diagnostic            *diag;
{
Return_code                     res;
Api_rc                          outcome;
Octet                           *return_string;
Octet                           *vendor_string;
struct Ft_diagnostic            *ft_diag = NULL;
        /*
        **   Initialize variables.
        */
        return_string = NULL;
        vendor_string = NULL;
        /*
        **   Call ft_gperror to get the printable strings for
        **   the return_code and vendor_code. Print the
        **   strings returned from ft_gperror.
        */
       res = ft_gperror( & result, & return_string, & vendor_string, & outcome
);
        if (res == SUCCESS) {
           if (return_string != NULL) {
              (void)printf("FTAM failure: return_code = %s\n", return_string);
              res = ft_fdmemory(return_string, & outcome);
              if (res != SUCCESS)
                 error_handler(outcome, ft_diag);
           }
           /*
           **   Print the vendor_code if it exists.
           */
           if (vendor_string != NULL) {
              (void)printf("FTAM failure: vendor_code = %s\n", vendor_string);
              res = ft_fdmemory(vendor_string, & outcome);
              if (res != SUCCESS)
                 error_handler(outcome, ft_diag);
           }
        }
```

```
            /*
            **   Traverse the diagnostic list and print the further_details strings.
            */
            while(diag != NULL) {
                (void)printf("FTAM failure: diagnostic number = %d\n",
                                diag-error_id);
                if(diag-further_details != NULL)
                    (void)printf("FTAM failure: diagnostic = %s\n",
                                 diag-further_details);
                diag = diag-next;
            }
            exit(-1);
    }
```

11 Document Types and Constraint Sets

Document Types

Document types define the semantics for classes of files. A document type defines the type of file contents by specifying a constraint set and the possible data types in the file. Example file types include text files, binary files, sequential files, and directories.

The following table shows information about the parameters in the cont_type.contents_info.document->parameters field for FTAM-1, FTAM-2, FTAM-3, and INTAP-1 document types. In all cases, the maximum string length is 6144 octets.

Document Type	String Type	String Significance
FTAM-1	General String (Default type)	Not Significant
	Visible String	Variable or Fixed
	Graphic String	Variable or Fixed
	Ia5 String	Not Significant
FTAM-2	Visible String	Not Significant
	Graphic String (Default type)	Not Significant
FTAM-3	Octet String	Not Significant
INTAP-1	Octet String	Variable or Fixed

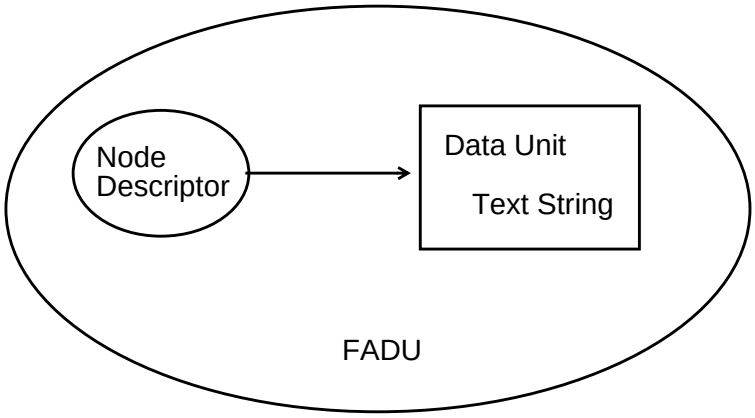
The NBS-9 document type parameter is used only on the ft_open() call. The attribute names you optionally supply list the attributes you will receive for each file in the directory. The default for HP-UX responders is all attributes. Other responders may have different defaults.

NOTE Refer to the “FTAM Data Structures” chapter for detailed information on setting document types using the Ft_document_type structure.

FTAM-1 Document Type

FTAM-1 has only one FADU that contains zero or more text strings. An FTAM-1 file contains only one string type, chosen from FT_CL_GENERAL_STRING, FT_CL_IA5_STRING, FT_CL_GRAPHIC_STRING, or FT_CL_VISIBLE_STRING (Figure 11-1)

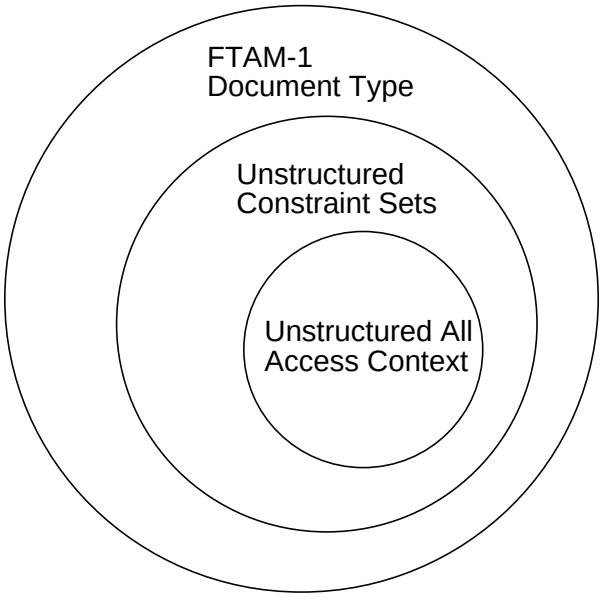
Figure 11-1 FTAM-1 Document Type Structure



You can only read from or write to the whole data unit (not parts of it).

FTAM-1 uses the Unstructured constraint set to restrict the file model, and therefore uses the Unstructured All access context (Figure 11-2). Refer to the “Constraint Sets” and “Access Contexts” sections for detailed information.

Figure 11-2 FTAM-1 Document Type Restrictions



NOTE Refer to the "FTAM Data Structures" chapter for detailed information on setting the FTAM-1 document type using the Ft_dt_ftam_1 structure.

FTAM-1 Document Semantics

The following semantics are mandatory for FTAM-1 document types.

- FTAM-1 uses restrictions specified by the Unstructured constraint set.
- FTAM-1 does not specify the semantics of the character strings.
- The characters are from FT_CL_GENERAL_STRING, FT_CL_IA5_STRING, FT_CL_GRAPHIC_STRING, or FT_CL_VISIBLE_STRING.

If the class parameter is not present, the default is FT_CL_GENERAL_STRING. The character strings may contain characters from any of the characters sets registered for use as C0, C1, G0, G1, G2, or G3 sets, including SPACE. [1] Refer to the "Character Sets" chapter for this list of characters.

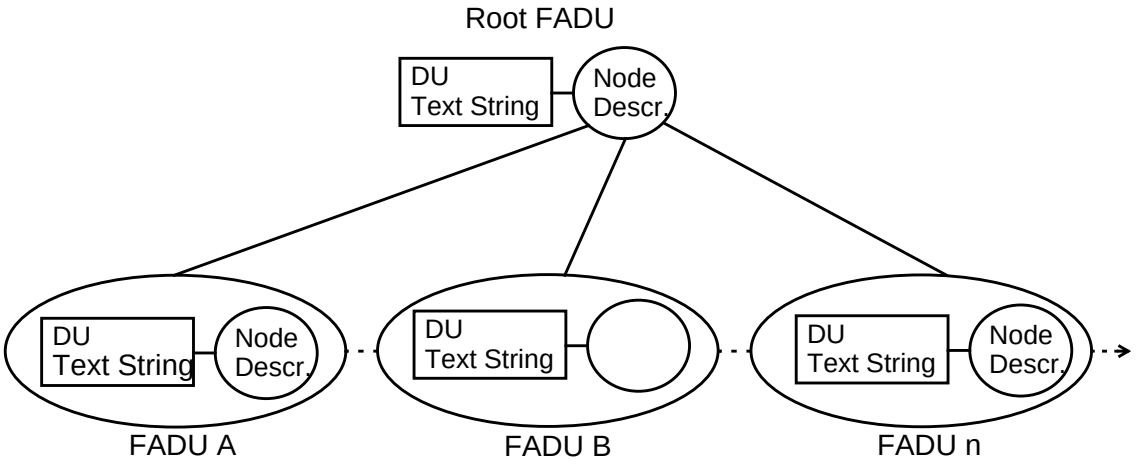
- The string_length parameter determines the length of maximum number of octets in each data element. HP–UX responders accept an unlimited string_length. If string_length is not present, the character strings have a maximum length of 6144.
- The string_significance parameter determines the exact significance of the character strings. Three values are supported:
  - FT_SS_NO_SIGNIFICANCE String (data element) boundaries are not preserved across transfers. For example, if you create a file using eight strings, you may or may not receive eight strings back when you read the file. Different FTAM implementations may break the file into strings in different ways.
  - FT_SS_FIXED String (data element) boundaries are preserved across transfers, and each string is of the size specified in the maximum string length parameter.
  - FT_SS_VARIABLE. String (data element) boundaries are preserved across transfers, and the length of each string is less than—or equal to—the size specified in the maximum string length parameter.

FTAM-2 Document Type

FTAM-2 contains zero or more FADUs, each of which contains zero or more text strings. For FTAM-2, you can have any number of FADUs and any amount of data (Figure 11-3). The data units are distinct. For example, if you send five data units and ask for them back, you will receive five distinct data units in return.

1. Registered in the International Register of Coded Characters Sets for use with Escape Sequences

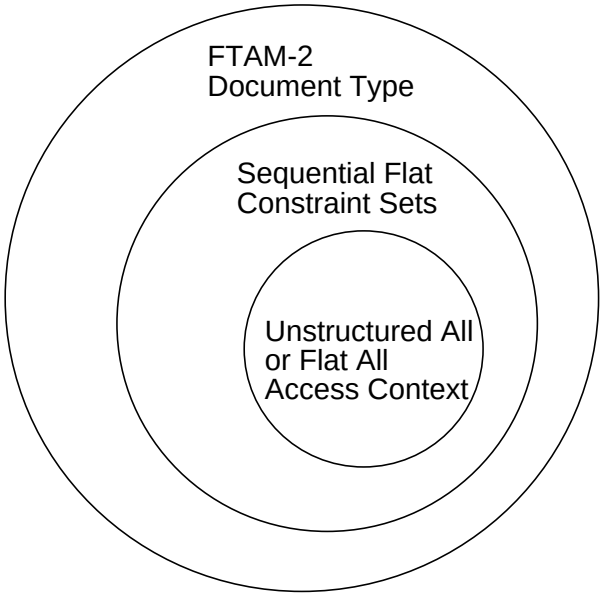
Figure 11-3 FTAM-2 Document Type Structure



FTAM-2 uses the Sequential Flat constraint set to restrict the file model, and therefore uses either the Unstructured All or Flat All access context (Figure 11-4).

Refer to the “Constraint Sets” and “Access Contexts” sections for detailed information.

Figure 11-4 FTAM-2 Document Type Restrictions



NOTE Refer to the "FTAM Data Structures" chapter for detailed information on setting the FTAM-2 document type using the Ft_dt_ftam_2 structure.

FTAM-2 Document Semantics

The following semantics are mandatory for FTAM-2 document types.

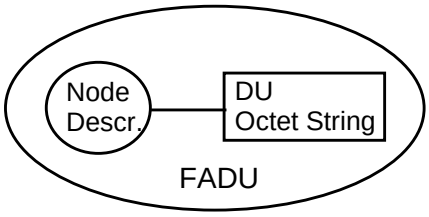
- FTAM-2 uses the restrictions specified by the Sequential Flat constraint set.
- FTAM-2 does not specify the semantics of the character strings.

- If the class parameter is not present, the default is FT_CL_GRAPHIC_STRING. The character strings may contain characters from any of the characters sets registered for use as G0, G1, G2, or G3 sets, including SPACE. [1] Refer to the “Character Sets” chapter for this list of characters.
- The string_length parameter determines the maximum number of octets in each data element. HP–UX responders accept an unlimited string_length. If the string_length parameter is not present, the character strings are unbounded.
- The string_significance parameter determines the exact significance of the character strings. Only the FT_SS_NO_SIGNIFICANCE value is valid. The character string boundaries are not preserved when you store the file and do not contribute to the document semantics.

FTAM-3 Document Type

FTAM-3 has only one FADU that contains zero or more binary octet strings (Figure 11-5).

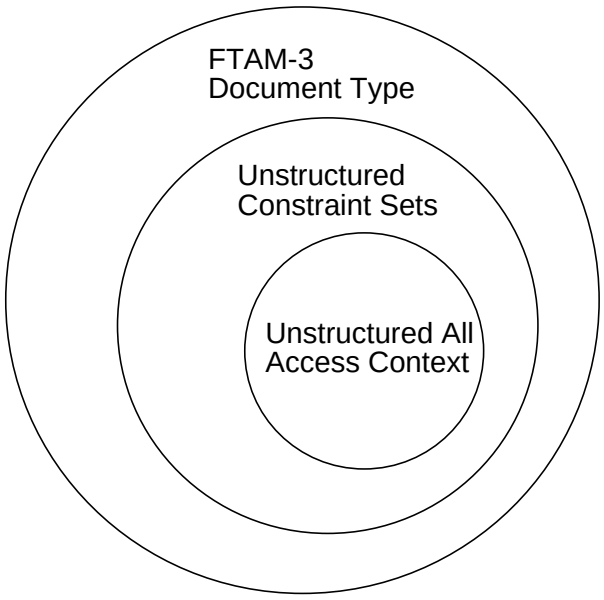
Figure 11-5 FTAM-3 Document Type Structure



FTAM-3 uses the Unstructured constraint set to restrict the file model, and therefore uses the Unstructured All access context (Figure 11-6). Refer to the “Constraint Sets” and “Access Contexts” sections for detailed information.

1. Registered in the International Register of Coded Characters Sets for use with Escape Sequences

Figure 11-6 FTAM-3 Document Type Restrictions



NOTE Refer to the “FTAM Data Structures” chapter for detailed information on setting the FTAM-3 document type using the Ft_dt_ftam_3 structure.

FTAM-3 Document Semantics

The following semantics are mandatory for FTAM-3 document types.

- FTAM-3 uses the constraints specified by the Unstructured constraint set.
- FTAM-3 does not specify the semantics of the binary strings.
- Each binary string contains octets of any value from 0 to 255. FTAM-3 does not constrain the meanings of these values.
- The default class parameter is FT_CL_OCTET_STRING.
- The string_length parameter determines the length of each binary string. HP–UX responders accept an unlimited string_length. If the string_length parameter is not present, the binary strings are unbounded.

- The string_significance parameter determines the exact significance of the character strings. Three values are supported:
  - FT_SS_NO_SIGNIFICANCE - the string or data element boundaries are not preserved across file transfers. For example, if you create a file using eight strings, you may or may not receive eight strings back when you read the file. Different FTAM implementations may break the file into strings in different ways.
  - FT_SS_FIXED - the string boundaries are preserved across transfers and each string is of the size specified in the maximum string length parameter.
  - FT_SS_VARIABLE - the string boundaries are preserved across transfers and the length of each string is less than or equal to the size specified in the maximum string length parameter.

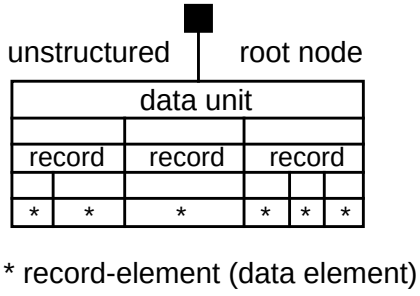
INTAP-1 Document Type

INTAP-1 has only one FADU that contains zero, one, or more records. Each record consists of octets of any value from 0 to 255. Figure 11-7 shows the INTAP-1 document type structure.

INTAP-1 uses the Unstructured constraint set to restrict the file model, and therefore uses the Unstructured All (UA) access context. Refer to the "Constraint Sets" and "Access Contexts" sections for detailed information.

Refer to the "FTAM Data Structures" chapter for detailed information on setting the INTAP-1 document type using the Ft_dt_intap_1 structure.

Figure 11-7 INTAP-1 Document Type Structure



INTAP-1 Document Semantics

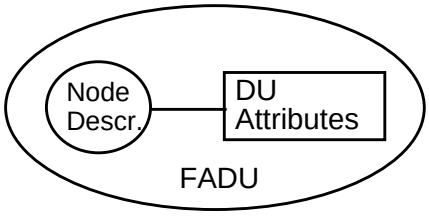
The following semantics are mandatory for INTAP-1 document types.

- An INTAP-1 document consists of one file access data unit, which consists only of zero, one, or more records. The order of these records is significant.
- Each record consists of octets of any value from 0 to 255. The meaning attached to these values is not constrained by the document type.
- There are no size or length limitations imposed by this definition, except for those specified here. Each record is of a length determined by the number of octets given by the maximum-record-length parameter. If this parameter is not present, the default is that the length of the records is unbounded. If the value of the record-significance parameter is variable, or if the parameter is not present, the length of each record is less than or equal to the length given in the maximum- record-length parameter. If the value is fixed, the length of each record is exactly equal to the length given.

NBS-9 Document Type

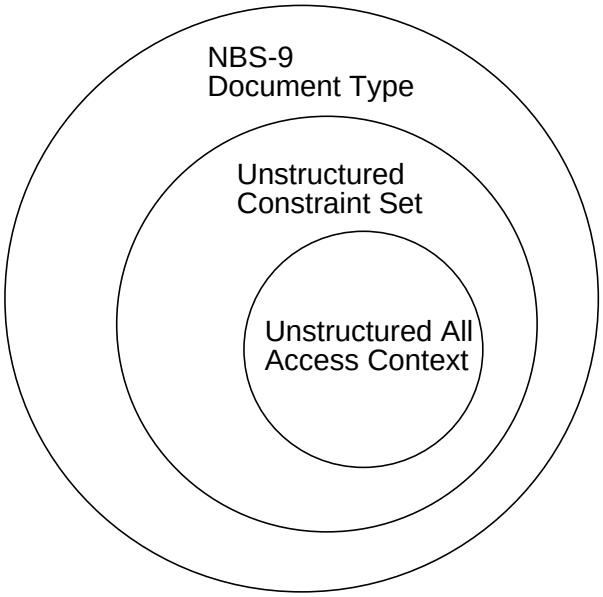
The NBS-9 document type models directories. Each NBS-9 document (directory) has only one FADU that contains zero or more data elements.(Figure 11-8).

Figure 11-8 NBS-9 Document Type Structure



NBS-9 uses the Unstructured constraint set to restrict the file model, and therefore uses the Unstructured All access context (Figure 11-9). Refer to the “Constraint Sets” and “Access Contexts” sections for detailed information.

Figure 11-9 NBS-9 Document Type Restrictions



NOTE Refer to the "FTAM Data Structures" chapter for detailed information on setting the NBS-9 document type using the Ft_dt_nbs_9 structure.

NBS-9 Document Semantics

The following semantics are mandatory semantics for NBS–9 document types.

- NBS-9 uses the Unstructured constraint set.
- Each data element contains the attributes of one file.
- The attribute_names parameter is only used on the open call. It denotes the set of attributes to be returned for each file in the directory. If this parameter is not present on the open call, the default is to return all attributes.
- According to the NIST Phase III agreements, responders only need to return the filename attribute. However, HP–UX responders return all attributes as specified in the attribute_names parameter supplied on the open call.

- The following table describes the legal operations on NBS-9 documents:

Table 11-1 Legal Operations for the NBS-9 Document Type

Standard (specified by the NIST agreements)	HP-UX FTAM Supports these Additional Value-Added Operations
select open read close deselect	create delete read attributes change attributes

Constraint Sets

Every application needs a specific set of file structures, and any real system is likely to support only a limited range of file types, with restrictions on the ways you can modify files. Constraint sets express these limitations by restricting the following items.

- Range of allowable file structures
- Ways in which basic access actions can modify the structure

Constraint sets restrict (reduce) the file model. These sets help you efficiently model the type of file you are accessing.

The constraints sets supported by HP–UX FTAM are Unstructured and Sequential Flat.

Unstructured	Single, un-named data unit
Sequential Flat	Series of un-named data units

Each constraint set consists of the following items.

- A statement of the intended field of application
- A constraint set descriptor for reference in documentation
- Constraint set identifier for reference in the FTAM protocol
- Constraints on the node names
- Set of valid file access actions
- Qualified actions when writing to the file
- Set of file access contexts in which the file can be read
- State of the file when created
- FADU located immediately after the file is opened
- Definitions of “beginning of file” and “end of file”
- Manner in which you read from or write to the whole file
- General constraints on how you can modify the structure

- Special semantics of specific file access actions
- Allowable FADU identity forms for each of the file access actions

Access Contexts

Each constraint set contains a list of available access contexts which allow you to further restrict the file structure view during read operations. The Access Contexts are Unstructured All Data Units (UA) and Flat All Data Units (FA).

For FTAM-1, FTAM-3, and INTAP-1, only the UA access context is available. For FTAM-2, both UA and FA are available. If you use the UA access context when transferring FTAM-2 files, the file simplifies to an FTAM-1 file; the node descriptor information does not transfer.

NOTE

Refer to the “FTAM Data Structures” chapter for detailed information on setting access contexts using the Ft_access_context structure.

Unstructured All (UA)	FT_UNSTRUCTURED_ALL_DATA_UNITS Only the data elements in the data unit (from the addressed FADU) transfer.
Flat All (FA)	FT_FLAT_ALL_DATA_UNITS Node descriptor information and data elements from the data unit (from the addressed FADU) transfer in the order that they are stored.

Unstructured Constraint Set

The unstructured constraint set applies to files that you can transfer or access in whole, or extend; partial access is not available.

Refer to the following list for applicable basic constraints.

Constraint Set Name	Unstructured
Constraint Set Identifier	ISO Standard 8571 constraint-set (4) unstructured (1) (ASN.1 syntax for an identifier)
Node Names	None
Available File Access Actions	FT_FA_ERASE FT_FA_EXTEND FT_FA_READ FT_FA_REPLACE
Qualified Actions	None
Available Access Contexts	FT_UNSTRUCTURED_ALL_DATA_UNITS (UA)
Creation State	Root node with an empty data unit
Location After Open	FT_FIRST
Beginning of File	Not applicable
End of File	Not applicable
Read Whole File	Read in access context UA with a FADU identity of FT_FIRST
Write Whole File	Transfer a single data unit (without a node descriptor) with a FADU identity of FT_FIRST and an FT_FA_REPLACE file access action

Additional constraints on the Unstructured constraint set are as follows.

Structural Constraints	All actions in the unstructured constraint set result in a structure with a root node that has a data unit (although this data unit may be empty).
Action Constraints	The FT_FA_ERASE action yields a root node with an empty data unit.
Identity Constraints	The FADU identity is always FT_FIRST. Use this form of FADU identity with all permitted file actions.

Sequential Flat Constraint Set

The Sequential Flat constraint set applies to files that are structured into a sequence of individual FADUs. You can access specific FADUs in the files by specifying their individual position in the sequence. Refer to the following list for applicable basic constraints.

Constraint Set Name	Sequential Flat
Constraint Set Identifier	ISO Standard 8571 constraint-set (4) sequential-flat (2) (ASN.1 syntax for an identifier)
Node Names	None
File Access Actions	FT_FA_ERASE FT_FA_LOCATE FT_FA_INSERT FT_FA_READ
Qualified Actions	None
Available Access Contexts	FT_FLAT_ALL_DATA_UNITS (FA) FT_UNSTRUCTURED_ALL_DATA_UNITS (UA)
Creation State	Root node without an associated data unit
Location After Open	Root node
Beginning of File	Root node

End of File	No node selected. FT_PREVIOUS gives last node in sequence; FT_CURRENT and FT_NEXT give an error
Read Whole File	Read in access context FA or UA with FADU identity of FT_BEGIN
Write Whole File	Transfer the series of leaf FADUs which would be generated by reading the whole file in access context FA; perform the transfer with a FADU identity of FT_END and an FT_FA_INSERT file access action

Additional constraints on the Sequential Flat constraint set are as follows:

Structural Constraints	The root node does not have an associated data unit. All children of the root node are leaf nodes and have an associated data unit. All arcs from the root node are of length one.
Action Constraints	You can use FT_FA_INSERT only at the end of a file, with FADU identity set to FT_END. The location following an FT_FA_INSERT action is FT_END. You can erase only at the root node to empty the file, with FADU identity set to FT_BEGIN. The result is a solitary root node without an associated data unit.
Identity Constraints	The FADU identity associated with the file action is FT_BEGIN, FT_END, FT_FIRST, or FT_NEXT. The allowable actions are as follows.

FT_FA_LOCATE	Actions are valid for each FADU identity on the whole file and on all leaf nodes.
FT_FA_READ	Actions are valid for the whole file at FT_BEGIN. Actions are valid for leaf nodes at FT_FIRST and FT_NEXT. Actions are not valid at FT_END.
FT_FA_INSERT	Actions are valid on the leaf node with the FT_END FADU identity.
FT_FA_ERASE	Actions are valid on the whole file only with the FT_BEGIN FADU identity.

12 Character Sets

Former Intro ... Change

This chapter defines the available character sets for the HP FTAM/9000 product.

All numbers are in decimal notation.

IA5String	The characters available for the IA5String are all characters with ordinal values between 0 and 127, inclusive. The exceptions are the characters with ordinal values 14 and 15.
GeneralString	The characters available for the GeneralString are all characters with ordinal values between 0 and 255, inclusive.
GraphicString	The characters available for the GraphicString are all characters with ordinal values • between 32 and 126, inclusive, and • between 160 and 255, inclusive. Additionally, the characters 27, 142, and 143 used within escape sequences are available.
VisibleString	The characters available for the VisibleString are all characters with ordinal values between 32 and 126, inclusive.

Glossary

Access Context A set of restrictions that dictates how the information in a file is accessed; you can specify access contexts only when reading a file.

Activity Attributes Attributes that define the properties that exist only while a specific FTAM connection is being used; these attributes are not part of the file.

Application Entity A uniquely identified component of your application program that associates it with OSI; may be an FTAM initiator or FTAM responder.

Application Interface Your means of accessing the FTAM services (e.g., ft_select()).

Application Service Element (ASE) Any of the services provided to you in the Application layer of the OSI model (e.g., FTAM and ACSE).

Association An ISO term, synonymous with ``connection."

Association Control Service Element (ACSE) An OSI layer seven protocol that provides association establishment, abort, and association termination.

Attribute Information that states a property of a file and takes a set of defined values, with each value having a defined meaning.

connection_id A unique identifier of a connection for the duration of that connection.

Constraint Set A set of restrictions that specify the allowable file structures and the ways in which access actions can modify the structures.

Context Free (CF) Function A function that does not depend on the use of other FTAM functions.

Context Sensitive (CS) Function A function that depends on the use of other FTAM functions; you must call context sensitive functions in a specific order.

Data Control Block (DCB)

Data structures used for passing information between user application programs and FTAM applications entities. The DCBs vary, depending on the function call.

Glossary

Data Element The smallest piece of data whose identity is preserved when transferred by the Presentation Service. A data element may convey file contents information or protocol control information.

Data Unit (DU) The file unit that contains the actual file contents; a data unit may contain file structuring information or data elements.

Document Type The specification that defines the type of file contents by specifying the allowable constraint sets.

Empty File An FTAM file that contains only a root node with no associated data unit or node name.

Event The synchronous or asynchronous invocation of an FTAM function.

Event Name A value used to uniquely define an event; returned on asynchronous calls.

FADU Identifier A means of identifying the FADU; location is the only valid value.

File Access The inspection, modification, replacement, or erasure of a file's contents or a portion of it.

File Access Data Unit (FADU)

The smallest unit of the file access structure on which you can transfer, delete, extend, replace, or insert; contains zero or more data unit; each FTAM file consists of one or more FADUs.

File Attribute The name and other identifiable properties that describe a file, excluding file contents.

File Contents A file's data units, node names, and structuring information that you can manipulate during the File Open regime.

File Management The creation and deletion of files; the inspection or manipulation of file attributes.

File Model A view of a file's structure.

File Protocol Data Unit (FPDU) The blocks of information transferred between FTAM initiators and FTAM responders.

Glossary

File Service User The portion of the application entity that invokes the FTAM service.

File Transfer A function that moves a part or the whole of a file's contents between open systems.

File Transfer, Access and Management An OSI layer seven protocol that allows peer-to-peer file transfer, record access, and file management.

FTAM See File Transfer, Access and Management

ftam_init The executable name for an HP–UX FTAM initiator; sends your request to an FTAM responder.

FTAM Protocol Machine (FPM) The protocol followed by FTAM to accomplish file transfer, access, and management.

ftam_resp The executable name for an HP–UX responder; daemon process that provides the interface for the HP–UX file system (real filestore) to the FTAM VFS.

Grouping A collection of FTAM functions that are transferred as a single FPDU.

High Level Service (HLS) A function that performs a sequence of low level functions, thereby eliminating the need to call the low level functions individually.

Indication Notification that a request arrived at its destination; notification that information is available. For example, a connect indication occurs when an FTAM responder receives your connect request (ft_connect()).

Initial Configuration Store (ICS) The database that stores the initial OSI network configuration.

Initiator The entity that submits requests on your behalf; when you call a function, the initiator sends your request to an FTAM responder.

International Organization for Standards (ISO) The United Nations body that conducts the balloting and ratification procedures for international communications standards.

Logging A diagnostic tool used to record significant network events; logging is always enabled while the network is operational.

Glossary

Low Level Service (LLS) A function that provides the lowest level of service for the MAP 3.0 application interface; a LLS does not contain a sequence of other calls.

Manufacturing Automation Protocol (MAP) A seven layer communications specification; allows multivendor communication among factory automation equipment without custom links.

Network Service Access Point (NSAP) An addressable point in the Network layer that provides services to the Transport layer; identified by a unique value that allows network layers to identify the connection to its peer.

Node The elementary component from which a FADU tree is built.

Node Name A name used to locate a node that is part of the structuring information contained in a FADU.

Note (an event) To indicate that a request was serviced and its outcome is available. For example, issuing an em_wait call is asking for the event that was noted for the longest period of time.

Open Systems Interconnection (OSI) A set of standards that define the seven layers of communication protocols for a network; ISO defines these standards.

Packet A unit of transmitted data, with a fixed maximum size.

Presentation Address An address used to communicate with other systems and processes; is unique within the network.

Presentation Service Data Unit (PSDU) The actual Presentation layer data transmitted to the peer Presentation layer.

Protocol A formalized set of rules for network communication.

Real File The actual file, including its name and attributes, that is mapped to the VFS.

Real Filestore A collection of actual files, including their names and attributes, that is mapped to the VFS.

Regime The period during which you can call a specific set of FTAM functions; the regime determines the activities that can occur at a given time and therefore, creates

the rules (protocols) for the FTAM state machine. (For example, the Data Transfer regime allows reading or writing of the file.) Regimes are nested.

Responder The entity that receives and services an initiator's request; if applicable, the responder returns a response; the responder interacts directly with the virtual filestore.

Sequential Flat Constraint Set

A constraint set that generates an access structure that
• consists of two levels (levels zero and one),
• may have data units at only the leaf nodes, and
• has no data unit at the root node.

Service Provider Process (SPP) See “Application Entity.”

State See “Regime.”

Threshold The number of functions (within a set of grouped functions) that must change regimes for the entire group to be successful.

Tracing A diagnostic tool that records specific events on individual HP OSI Transport Services subsystems. Tracing degrades system performance and thus, is not always enabled.

Unstructured Constraint Set A constraint set that contains a single root node with a data unit; no file structure information is available.

Virtual Filestore (VFS) An abstract model for describing files and their attributes, and the possible actions on them; provides a uniform interface to all real file systems.

Glossary

Index

Index

Index

Index

Index

Index