Apple Filing Protocol Reference

Companion guide	Apple Filing Protocol Programming Guide

Overview

This document describes the Apple Filing Protocol (AFP) commands, data types and constants that can be used to communicate with an AFP file server. AFP allows users of multiple computers to share files easily and efficiently over a network.

In this protocol reference, references to a `string` type indicate a Pascal string. The first byte of a Pascal string indicates the string length (0–255), and is followed by up to 255 bytes of text. Pascal strings are not null-terminated.

Note: All AFP data is transmitted in big endian format.

For conceptual information, along with a complete list of differences between various AFP protocol versions, see the companion programming guide.

Functions by Task

This specification is a list of commands that are part of the Apple Filing Protocol wire protocol. These are primarily of interest to developers writing AFP client or server software. These are `not` commands that can be entered from a Terminal prompt.

AFP Protocol Commands

These commands are sent at the AFP layer. This layer sits on top of the DSI layer. The DSI layer commands are described in “DSI Transport Layer Commands.”

`FPAccess`
`FPAddAPPL`
`FPAddComment`
`FPAddIcon`
`FPByteRangeLock`
`FPByteRangeLockExt`
`FPCatSearch`
`FPCatSearchExt`
`FPChangePassword`
`FPCloseDir`
`FPCloseDT`
`FPCloseFork`
`FPCloseVol`
`FPCopyFile`
`FPCreateDir`
`FPCreateFile`
`FPCreateID`

FPDelete
FPDeleteID
FPDisconnectOldSession
FPEnumerate
FPEnumerateExt
FPEnumerateExt2
FPExchangeFiles
FPFlush
FPFlushFork
FPGetACL
FPGetAPPL
FPGetAuthMethods
FPGetComment
FPGetExtAttr
FPGetFileDirParms
FPGetForkParms
FPGetIcon
FPGetIconInfo
FPGetSessionToken
FPGetSrvrInfo
FPGetSrvrMsg
FPGetSrvrParms
FPGetUserInfo
FPGetVolParms
FPListExtAttrs
FPLogin
FPLoginCont
FPLoginExt
FPLogout
FPMapID
FPMapName
FPMoveAndRename
FPOpenDir
FPOpenDT
FPOpenFork
FPOpenVol
FPRead
FPReadExt
FPRemoveAPPL
FPRemoveComment
FPRemoveExtAttr
FPRename
FPResolveID
FPSetACL
FPSetDirParms
FPSetExtAttr
FPSetFileDirParms
FPSetFileParms
FPSetForkParms
FPSetVolParms

`FPSpotlightRPC`

`FPSyncDir`

`FPSyncFork`

`FPWrite`

`FPWriteExt`

`FPZzzzz`

DSI Transport Layer Commands

`DSIOpenSession`

`DSICommand`

`DSIWrite`

`DSIAttention`

`DSITickle`

`DSICloseSession`

`DSIGetStatus`

Functions

DSIAttention

Sent by the server to notify the client of a status change.

```
    uint8_t flags;
    uint8_t command;
    uint16_t requestID;
    union {
       uint32_t errorCode;
       uint32_t writeOffset;
};
    uint32_t totalDataLength;
    uint32_t reserved;
    uint8_t attentionPayload[];
```

Parameters

flags

Indicates whether the packet is a request or reply.

`0x00` = request

`0x01` = reply

command

The command code (`8`).

requestID

The request ID. See `DSIHeader` for more information.

writeOffset

Set to zero (`0`).

errorCode

On response, the error code that occurred.

totalDataLength

Set to the length of the `optionPayload` data blob.

reserved

Reserved. Set to zero (`0`).

attentionPayload

The packet payload—a variable-length block of option data in the format described in the discussion below.

Discussion

The AFP server uses standard data stream packets to send `DSIAttention` packets to the client. The attention code is stored as part of the data in the DSI packet. The size of the attention code and any other attention data cannot be larger than the size specified by the attention quantum when the client opened the session. The default attention quantum size is `2`. See “AFPUserBytes Definitions” for more information.

DSICloseSession

Closes a DSI session.

```
    uint8_t flags;
    uint8_t command;
    uint16_t requestID;
    union {
       uint32_t errorCode;
       uint32_t writeOffset;
};
    uint32_t totalDataLength;
    uint32_t reserved;
```

Parameters

flags

Always zero (`0`) to indicate that it contains a request. The client does not wait for a reply.

command

The command code (`1`).

requestID

The request ID. See `DSIHeader` for more information.

writeOffset

Set to zero (`0`).

errorCode

On response, the error code that occurred.

totalDataLength

Set to zero (`0`).

reserved

Reserved. Set to zero (`0`).

Discussion

To close a session, an AFP client or server sends a `DSICloseSession` command request. Without waiting for a reply, the sender of the `DSICloseSession` command closes the AFP session and reclaims all of the resources allocated to the session. Then it tears down the data stream connection.

> **Note:** The `AFPLogout` command does not close the session.

DSICommand

Passes an AFP protocol request to the server.

```
    uint8_t flags;
    uint8_t command;
    uint16_t requestID;
    union {
       uint32_t errorCode;
       uint32_t writeOffset;
};
    uint32_t totalDataLength;
```

```
    uint32_t reserved;
    uint8_t afpRequestPayload[];
```

Parameters

flags

Indicates whether the packet is a request or reply.

`0x00` = request

`0x01` = reply

command

The command code (`2`).

requestID

The request ID. See `DSIHeader` for more information.

writeOffset

Set to zero (`0`).

errorCode

On response, the error code that occurred.

totalDataLength

Set to the length of the AFP request payload.

reserved

Reserved. Set to zero (`0`).

afpRequestPayload

The packet payload—a variable-length block of option data containing an AFP request.

Discussion

Once the client opens a DSI session, the DSI is ready to accept and process `DSICommand` requests from the client. When it receives a `DSICommand` request, the DSI removes the header, saves the request context in its internal state, and passes the data (an AFP request) to the AFP server.

When the DSI receives a reply, it uses the *command* and *requestID* fields in the DSI header of the reply to match the reply with its corresponding request and request context in order to send the reply to the client. Once the DSI sends the reply to the client, the DSI reclaims storage allocated for the request context.

> **Note:** For the `FPWrite`, `FPWriteExt`, and `FPAddIcon` AFP commands, use `DSIWrite` instead.

DSIGetStatus

Passes an AFP `FPGetSrvrInfo` request to the server.

```
    uint8_t flags;
    uint8_t command;
    uint16_t requestID;
    union {
       uint32_t errorCode;
       uint32_t writeOffset;
};
    uint32_t totalDataLength;
    uint32_t reserved;
```

Parameters

flags

Indicates whether the packet is a request or reply.

`0x00` = request

`0x01` = reply

command

The command code (`3`).

requestID
The request ID. See `DSIHeader` for more information.

writeOffset
Set to zero (`0`).

errorCode
On response, the error code that occurred.

totalDataLength
Set to the length of the `statusPayload` data blob.

reserved
Reserved. Set to zero (`0`).

Discussion

After the command header above, the DSI packet contains a payload consisting of the `FPGetSrvrInfo` request or response packet.

In the context of data stream communication, the client must establish a session with the server in order to exchange information with it, but in the context of ASP, a client can send an `ASPGetStatus` command to the server without establishing a session. To support `ASPGetStatus`, the AFP server supports the `DSIGetStatus` command on its listening port.

To obtain ASP status information, the client must establish a connection on the server's listening port. The client then sends a `DSIGetStatus` command to the server. The server then returns the status information to the client and immediately tears down the connection.

DSIOpenSession

Opens a DSI session.

```
    uint8_t flags;
    uint8_t command;
    uint16_t requestID;
    union {
       uint32_t errorCode;
       uint32_t writeOffset;
 };
    uint32_t totalDataLength;
    uint32_t reserved;
    struct optionsPayload {
       uint8_t optionType;
       uint8_t optionLength;
       uint8_t optionData[];
 } Options[];
```

Parameters

flags
Indicates whether the packet is a request or reply.

`0x00` = request

`0x01` = reply

command
The command code (`4`).

requestID
The request ID. See `DSIHeader` for more information.

writeOffset
Set to zero (`0`).

errorCode
On response, the error code that occurred.

totalDataLength

Set to the length of the `optionPayload` data blob.

reserved
Reserved. Set to zero (`0`).

optionsPayload
The packet payload—a variable-length block of option data in the format described below.

Discussion
Usually, the `DSIOpenSession` command request is the first request issued by the client after it establishes a connection with an AFP server. (The client can also send a `DSIGetStatus` command request. In this case, the AFP server immediately tears down the connection after delivering the requested status information.) The `DSIOpenSession` command request opens a DSI session and delivers the client's initial request ID.

The data portion of a `DSIOpenSession` packet may contain options defined by the client (request) or server (reply). The options must conform to the format shown in Figure 1.

Figure 1 AFP DSIOpenSession option format

Table 1 describes each field in the option portion of the `DSIOpenSession` packet.

Table 1 Fields in the option portion of the `DSIOpenSession` packet

Field	Purpose

optionType	An unsigned 8-bit value indicating the type of information contained by the *optionData* field. Two types are defined:
	`enum`
	`{`
	`kRequestQuanta = 0x00,`
	`kServerReplayCacheSize = 0x02`
	`};`
	`0x00` = server request quantum. Sent by the server to the client to indicate that the *optionData* field contains the size of the largest request packet the server can accept. The option length is four bytes.
	`0x02` = maximum replay cache size supported. Sent by the server to the client to indicate the maximum number of elements that the server replay cache supports. The option length is four bytes.

optionLength	An unsigned 8-bit value containing the length of the variable-length *optionData* field that follows.
optionData	A variable-length value sent in network byte order (most significant byte first) representing the number of bytes the server and the client can accept in request and attention packets, respectively, but not including the length of the DSI header and the AFP command. The length of the *Option* field is variable, but for maximum performance, it should be a multiple of 4 bytes.

DSITickle

Notifies the server that the client is still alive or vice versa.

```
    uint8_t flags;
    uint8_t command;
    uint16_t requestID;
    union {
       uint32_t errorCode;
       uint32_t writeOffset;
};
    uint32_t totalDataLength;
    uint32_t reserved;
```

Parameters

flags

Indicates whether the packet is a request or reply. Always zero (`0`) because a Tickle does not require a reply.

command

The command code (`5`).

requestID

The request ID. See `DSIHeader` for more information.

writeOffset

Set to zero (`0`).

errorCode

On response, the error code that occurred.

totalDataLength

Set to the zero (`0`).

reserved

Reserved. Set to zero (`0`).

Discussion

The `DISTickle` command provides a way for AFP servers and clients to detect time-outs caused by the abnormal termination of DSI sessions and data stream connections. By default, an AFP server sends a `DSITickle` command request packet every 30 seconds to the client if the AFP server has not sent any other data to the client in the previous 30 seconds. Likewise, the client sends a `DSITickle` command request packet every 30 seconds to the client if the client server has not sent any other data to the AFP server in the previous 30 seconds.

If an AFP server does not receive any data from a client for two minutes, the AFP server terminates the session with the client. Likewise, the client terminates the session with the AFP server if the client does not receive any data from the server for two minutes. Instead of using a timer to determine when to send a `DSITickle` command, many client implementations send a `DSITickle` command whenever they receive a `DSITickle` command from the AFP server.

DSIWrite

Passes an AFP `FPWrite`, `FPWriteExt`, or `FPAddIcon` request to the server.

```
    uint8_t flags;
    uint8_t command;
    uint16_t requestID;
    union {
       uint32_t errorCode;
       uint32_t writeOffset;
};
    uint32_t totalDataLength;
    uint32_t reserved;
    uint8_t afpRequestPayload[];
```

Parameters

flags

Indicates whether the packet is a request or reply.

`0x00` = request

`0x01` = reply

command

The command code (6).

requestID
The request ID. See `DSIHeader` for more information.

writeOffset
Set to the number of bytes in the packet representing AFP command information. The server uses this information to collect the AFP command part of the packet before it accepts the actual data to write.

For example, when a client sends an FPWrite command to write data on the server, the enclosed data offset should be `12`.

errorCode
On response, the error code that occurred.

totalDataLength
Set to the length of the AFP request payload.

reserved
Reserved. Set to zero (`0`).

afpRequestPayload
The packet payload—a variable-length block of option data containing an AFP request.

Discussion

The `DSIWrite` command request contains an `FPWrite`, `FPWriteExt`, or `FPAddIcon` request and the associated data. The amount of data to be written may be up to the size of the server request quantum described earlier in `DSIOpenSession`.

The AFP server may or may not be ready to accept the data, so the DSI only forwards the AFP request portion to the AFP server, using the enclosed data offset in the DSI header to determine the length of the AFP header.

Once it processes the header and determines that the client has the privileges required to write the data, the AFP server retrieves the data to be written from the DSI. Once the AFP server declines the request or the DSI finds that all of the data has been written, the DSI disposes of the data and reclaims the storage associated with it.

FPAccess

Checks for permission to access a file or directory on a volume for which ACLs are enabled.

```
uint8_t CommandCode
uint8_t Pad
int16_t VolumeID
int32_t DirectoryID
uint16_t Bitmap
16 bytes UUID
int32_t ReqAccess
uint8_t Pathtype
string Pathname
```

Parameters

CommandCode
`kFPAccess` (75).

Pad
Pad byte.

VolumeID
Volume identifier.

DirectoryID
Directory identifier.

Bitmap
Reserved.

UUID

Universally Unique Identifier (UUID) of the process sending this command.

ReqAccess

Requested access. For definitions, see “ACL Access Rights.”

PathType

Type of names in `Pathname`. See “Path Type Constants” for possible values.

Pathname

Pathname to the file or directory for which access is being requested. `Pathname` is a string if it contains Short or Long Names or an AFPName if it contains a UTF-8–encoded path. See the Character Encoding section of “Apple Filing Protocol Concepts” in *Apple Filing Protocol Programming Guide* for additional details about the UTF-8 encoding used by AFP.

Result

`kFPNoErr` if access is allowed. See Table 3 for other possible result codes.

Discussion

The request is sent to the server, which determines whether to grant access.

Support for this command, as well as `FPGetACL` and `FPSetACL` is required in order to support access control lists (ACLs). Support for UTF-8 and UUIDs is also required in order to support ACLs. See the Character Encoding section of “Apple Filing Protocol Concepts” in *Apple Filing Protocol Programming Guide* for additional details about the UTF-8 encoding used by AFP.

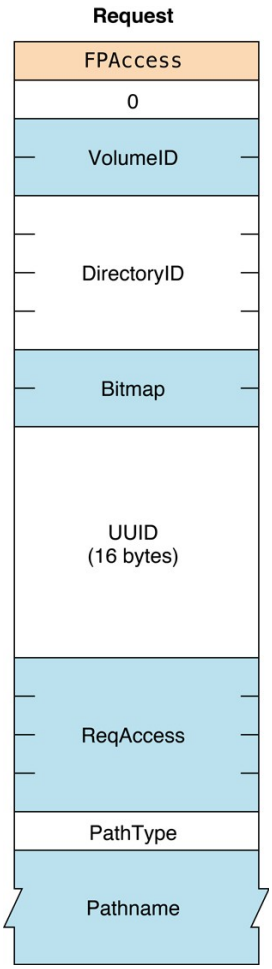
Table 2 lists the result codes for the `FPAccess` command.

Table 2 Result codes for the `FPAccess` command

Result code	Explanation
`kFPAccessDenied`	User does not have the access privileges required to request access to the file or directory.
`kFPMiscErr`	Non-AFP error occurred.
`kFPObjectNotFound`	Input parameters do not point to an existing file or directory.
`kFPParamErr`	A parameter is invalid.

Figure 2 shows the request block for the `FPAccess` command.

Figure 2 Request block for the `FPAccess` command



Version Notes

Introduced in AFP 3.2.

FPAddAPPL

Adds an APPL mapping to the Desktop database.

```
uint8_t CommandCode
uint8_t Pad
int16_t DTRefNum
int32_t DirectoryID
int32_t FileCreator
int32_t ApplTag
uint8_t PathType
string Pathname
```

Parameters

CommandCode

`kFPAddAPPL` (53).

Pad

Pad byte.

DTRefNum

Desktop database reference number.

DirectoryID

Ancestor Directory ID.

FileCreator
File creator of the application corresponding to the APPL mapping being added.

ApplTag
User-defined tag stored with the APPL mapping.

PathType
Type of names in `Pathname`. See "Path Type Constants" for possible values.

Pathname
Pathname to the application corresponding to the APPL mapping being added. `Pathname` is a string if it contains Short or Long Names or an AFPName if it contains a UTF-8-encoded path. See the Character Encoding section of "Apple Filing Protocol Concepts" in *Apple Filing Protocol Programming Guide* for additional details about the UTF-8 encoding used by AFP.

Result
`kFPNoErr` if no error occurred. See Table 3 for other possible result codes.

Reply block
None.

Discussion
This command adds the specified mapping to the volume's Desktop database, including the application's location, and file creator. If an APPL mapping for the same application (same filename, same directory, and same file creator) already exists, the mapping is replaced.

The user must have search or write privileges to all ancestors except the application's parent directory, as well as write access to the parent directory.

There may be more than one application in the Desktop database's list of APPL mappings for a given file creator. To distinguish among them, the `ApplTag` parameter is stored with each APPL mapping. The tag information may be used to decide among these multiple applications and is not interpreted by the Desktop database.

The user must have previously called `FPOpenDT` for the corresponding volume. In addition, the application must be present in the specified directory before this command is sent.

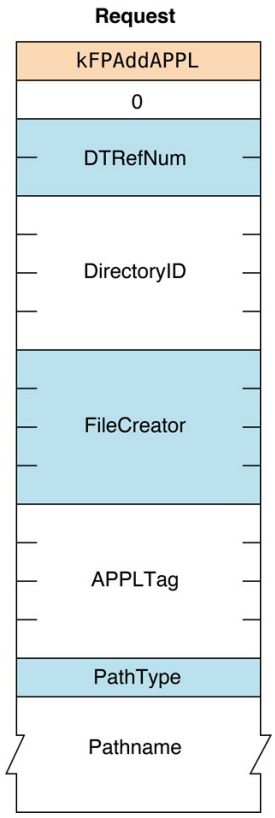
Table 3 lists the result codes for the `FPAddAPPL` command.

Table 3 Result codes for the `FPAddAPPL` command

Result code	Explanation
`kFPAccessDenied`	User does not have the access privileges required to add an APPL mapping.
`kFPMiscErr`	Non-AFP error occurred.
`kFPObjectNotFound`	Input parameters do not point to an existing file.
`kFPObjectTypeErr`	Input parameters point to a directory.
`kFPParamErr`	Session reference or Desktop database reference number is unknown; pathname is invalid.

Figure 3 shows the request block for the `FPAddAPPL` command.

Figure 3 Request block for the `FPAddAPPL` command



Availability

Deprecated. The Desktop Database Manager no longer exists in Mac OS v.10.6 and later.

FPAddComment

Adds a comment for a file or directory to a volume's Desktop database.

```
uint8_t CommandCode
uint8_t Pad
int16_t DTRefNum
int32_t DirectoryID
uint8_t PathType
string Pathname
string Comment
```

Parameters

CommandCode

`kFPAddComment` (56).

Pad

Pad byte.

DTRefNum

Desktop database reference number.

DirectoryID

Ancestor Directory ID.

PathType

Type of name in `Pathname`. See "Path Type Constants" for possible values.

Pathname

Pathname to the file or directory with which the comment is to be associated. `Pathname` is a string if it contains Short or Long Names or an AFPName if it contains a UTF-8–encoded path. See the Character Encoding section of

"Apple Filing Protocol Concepts" in *Apple Filing Protocol Programming Guide* for additional details about the UTF-8 encoding used by AFP.

Comment

Comment data to be associated with the specified file or directory.

Result

`kFPNoErr` if no error occurred. See Table 4 for other possible result codes.

ReplyBlock

None.

Discussion

This command stores the comment data in the Desktop database and associates the comment with the specified file or directory. If the comment is longer than 199 bytes, the comment is truncated to 199 bytes without returning an error.

To add a comment to a directory that is not empty, the user needs search access to all ancestors including the directory's parent directory, as well as write access to the parent directory. To add a comment to an empty directory, the user needs search or write access to all ancestors except the directory's parent directory, as well as write access to the parent directory.

To add a comment to a file that is not empty, the user needs search access to all ancestors except the file's parent directory, as well as read and write access to the parent directory. To add a comment to an empty file, the user needs search or write access to all ancestors except the files's parent directory, as well as write access to the parent directory.

The user must have previously called `FPOpenDT` for the corresponding volume. In addition, the specified file or directory must be present in the specified directory before this command is sent.

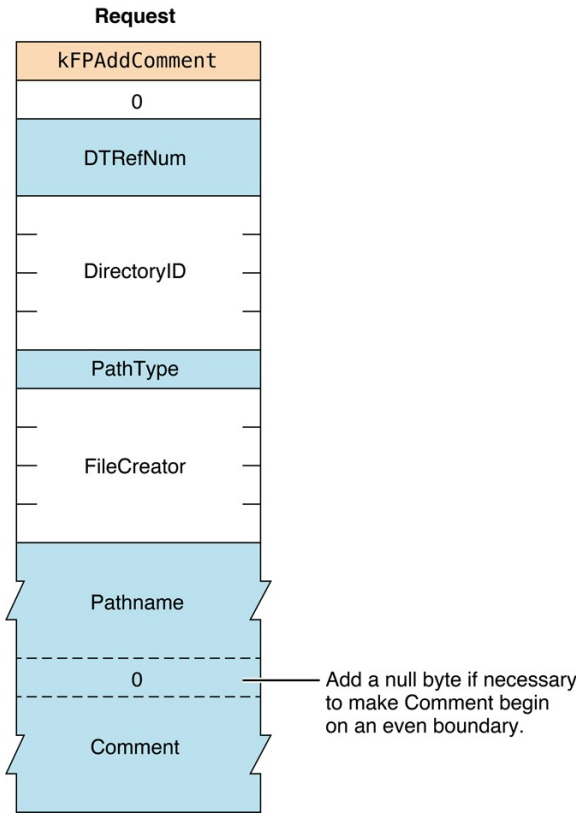
Table 4 lists the result codes for the `FPAddComment` command.

Table 4 Result codes for the `FPAddComment` command

Result code	Explanation
`kFPAccessDenied`	User does not have the access privileges required to add a comment.
`kFPObjectNotFound`	Input parameters do not point to an existing file or directory.
`kFPMiscErr`	Non-AFP error occurred.

Figure 4 shows the request block for the `FPAddComment` command.

Figure 4 Request block for the `FPAddComment` command



Availability

Deprecated. The Desktop Database Manager no longer exists in Mac OS v.10.6 and later.

FPAddIcon

Adds an icon bitmap to a volume's Desktop database.

```
uint8_t CommandCode
uint8_t Pad
int16_t DTRefNum
int32_t FileCreator
int32_t FileType
uint8_t IconType
uint8_t Pad
int32_t IconTag
int16_t BitmapSize
```

Parameters

CommandCode

`kFPAddIcon` (192).

Pad

Pad byte.

DTRefNum

Desktop database reference number.

FileCreator

File creator associated with the icon that is to be added.

FileType

File type associated with the icon that is to be added.

IconType

Type of icon that is to be added.

Pad
Pad byte.

IconTag
Tag information to be stored with the icon.

BitmapSize
Size of the bitmap for this icon.

Result
`kFPNoErr` if no error occurred, `kFPParamErr` if the session reference number or the Desktop database reference number is unknown or if the pathname is invalid, `kFPIconTypeError` if the new icon's size is different from the size of the existing icon, or `kFPMiscErr` if an error occurred that is not specific to AFP.

ReplyBlock
None.

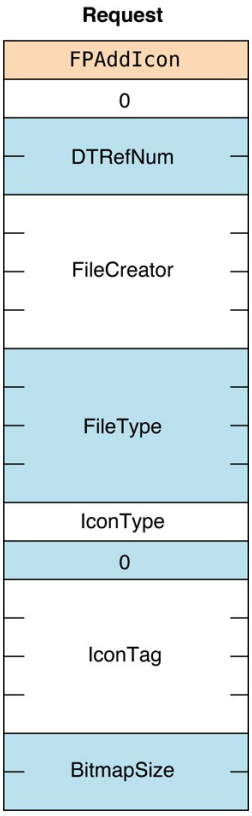
Discussion

This command adds the icon for the specified file creator and icon type to the Desktop database and associates the tag information with the icon. If an icon of the same file creator and icon type already exists in the database, the icon is replaced. However, if the new icon's size is different from the old icon, the server returns a `kFPIconTypeError` result code.

The user must have previously called `FPOpenDT` for the corresponding volume.

Figure 5 shows the request block for the `FPAddIcon` command.

Figure 5 Request block for the `FPAddIcon` command



Availability

Deprecated. The Desktop Database Manager no longer exists in Mac OS v.10.6 and later.

FPByteRangeLock

Locks or unlocks a specified range of bytes within an open fork.

```
uint8_t CommandCode
uint8_t Flags
int16_t OForkRefNum
int32_t Offset
int32_t Length
```

Parameters

CommandCode

`kFPByteRangeLock` (1).

Pad

Pad byte.

DTRefNum

Bit 0 is the `LockUnlock` bit, where 0 indicates lock and 1 indicates unlock. Bit 7 is the `StartEndFlag` bit, where 0 indicates that `Offset` is relative to the beginning of the fork and 1 indicates that `Offset` is relative to the end of the fork. The `StartEndFlag` bit is only used when locking a range.

OForkRefNum

Open fork reference number.

Offset

Offset to the first byte of the range to be locked or unlocked (can be negative if the StartEndFlag bit is set to 1).

Length

Number of bytes to be locked or unlocked (a signed, positive `int32_t`; cannot be negative except for the special value $FFFFFFFF).

Result

`kFPNoErr` if no error occurred. See Table 5 for possible result codes.

ReplyBlock

If the result code is `kFPNoErr` and the reply is for an attempt to lock or unlock a range, the server returns a reply block. The reply block consists of an `int32_t`, called `RangeStart`, containing the number of the first byte of the range that was locked.

Discussion

This command locks and unlocks the specified range of bytes within an open fork for use by a user application. When locking a range, the server returns the number of the first locked byte.

Bytes are numbered from 0 to $7FFFFFFF. The latter value is the maximum size of the fork. The end of fork is one more than the number of the last byte in the fork.

If no user holds a lock on any part of the requested range, the server locks the range specified by this command. A user can hold multiple locks within the same open fork, up to a server-specific limit. Locks cannot overlap. A locked range can start or extend past the end of fork; this does not move the end of fork or prevent another user from writing to the fork past the locked range. Setting `Offset` to zero, the `StartEndFlag` bit to zero (start), and `Length` to $FFFFFFFF locks the entire fork to the maximum size of the fork. Setting `Offset` to a value other than zero, the `StartEndFlag` bit to zero, and `Length` to $FFFFFFFF locks a range beginning at `Offset` and extending to the maximum size of the fork.

Setting the `StartEndFlag` bit to 1 (end) allows a lock to be offset relative to the end of the fork. This enables a user to set a lock when the user does not know the exact end of the fork, as can happen when multiple writers are concurrently modifying the fork. The server returns the number of the first locked byte.

Lock conflicts are determined by the value of `OForkRefNum`. That is, if a fork is opened twice, the two open fork reference numbers are considered two different “users” regardless of whether they were opened for the same or different sessions.

All locks held by a user are unlocked when the user closes the fork. Unlocking a range makes it available to other users for reading and writing. The server returns a result code of `kFPRangeNotLocked` if a user tries to unlock a range that was locked by another user or that was not locked at all.

To unlock a range, the `StartEndFlag` bit must be set to zero (start), `Length` must match the size of the range that was locked, and `Offset` must match the number of the first byte in the locked range. If the range was locked with the `StartEndFlag` bit set to zero (start), use the same value of `Offset` to unlock the range that was used to lock the range. If the range was locked with the `StartEndFlag` bit set to 1 (end), set `Offset` to the value of `RangeStart` that was returned by the server. You cannot unlock part of range.

OS X supports memory-mapped files, but byte range locks should not be used in conjunction with them.

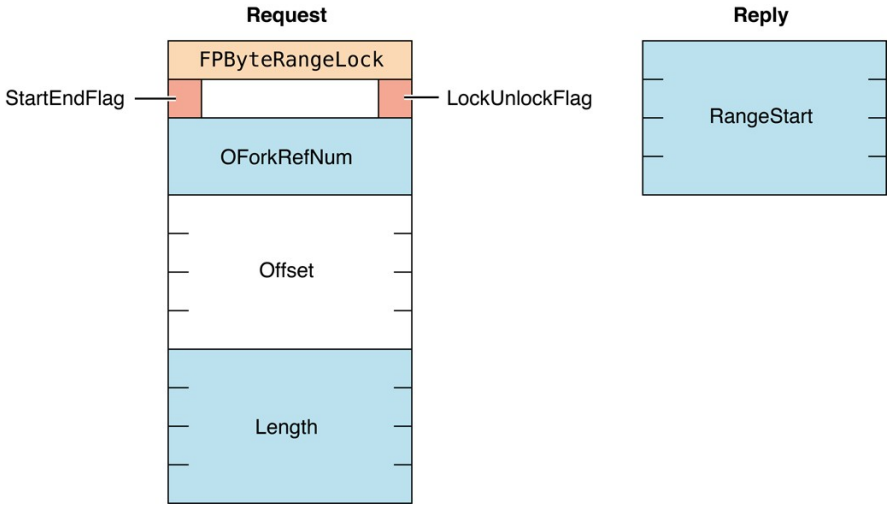
Table 5 lists the result codes for the `FPByteRangeLock` command.

Table 5 Result codes for the `FPByteRangeLock` command

Result code	Explanation
`kFPLockErr`	Some or all of the requested range is locked by another user.
`kFPMiscErr`	Non-AFP error occurred.
`kFPNoMoreLocks`	Server's maximum lock count has been reached.
`kFPParamErr`	Session reference number or open fork reference number is unknown; a combination of the StartEndFlag bit and Offset specifies a range that starts before byte zero.
`kFPRangeNotLocked`	User tried to unlock a range that is locked by another user or that is not locked at all.
`kFPRangeOverlap`	User tried to lock some or all of a range that the user has already locked.

Figure 6 shows the request and reply blocks for the `FPByteRangeLock` command.

Figure 6 Request and reply blocks for the `FPByteRangeLock` command



Availability

Deprecated in AFP 3.x. Use `FPByteRangeLockExt` instead.

FPByteRangeLockExt

Locks or unlocks a specified range of bytes within an open fork.

```
uint8_t CommandCode
uint8_t Flags
int16_t OForkRefNum
int64_t Offset
int64_t Length
```

Parameters

CommandCode

`kFPByteRangeLockExt` (59).

Pad

Pad byte.

Flags

Bit 0 is the `LockUnlock` bit, where 0 indicates lock and 1 indicates unlock. Bit 7 is the `StartEndFlag` bit, where 0 indicates that `Offset` is relative to the beginning of the fork and 1 indicates that `Offset` is relative to the end of the fork. The `StartEndFlag` bit is only used when locking a range.

OForkRefNum

Open fork reference number.

Offset

Offset to the first byte of the range to be locked or unlocked (can be negative if the StartEndFlag bit is set to 1).

Length

Number of bytes to be locked or unlocked (a signed, positive `int32_t`; cannot be negative except for the special value $FFFFFFFFFFFFFFFF).

Result

`kFPNoErr` if no error occurred. See Table 6 for possible result codes.

ReplyBlock

If the result code is `kFPNoErr` and the reply is for an attempt to lock or unlock a range, the server returns a reply block. The reply block consists of an `int32_t` called `RangeStart` containing the number of the first byte of the range that was locked.

Discussion

This command locks and unlocks the specified range of bytes within an open fork for use by a user application. When locking a range, the server returns the number of the locked byte.

The `FPByteRangeLockExt` command differs from the `FPByteRangeLock` command in that the `FPByteRangeLockExt` command is prepared to handle large values that may be required for locking ranges for volumes larger than 4 GB in size.

Bytes are numbered starting from 0. The end of fork is one more than the number of the last byte in the fork.

If no user holds a lock on any part of the requested range, the server locks the range specified by this command. A user can hold multiple locks within the same open fork, up to a server-specific limit. Locks cannot overlap. A locked range can start or extend past the end of the fork; this does not move the end of the fork or prevent another user from writing to the fork past the locked range.

Setting `Offset` to zero, the `StartEndFlag` bit to zero (start), and `Length` to `0xFFFFFFFFFFFFFFFF` locks the entire fork to the maximum size of the fork.

Specifying an offset other than zero, the `StartEndFlag` bit to zero (start), and `Length` to `0xFFFFFFFFFFFFFFFF` locks a range beginning at `Offset` and extending to the maximum size of the fork.

Setting the `StartEndFlag` bit to 1 (end) allows a lock to be offset relative to the end of the fork. This enables a user to set a lock when the user does not know the exact end of the fork, as can happen when multiple writers are concurrently modifying the fork. The server returns the number of the first locked byte.

Lock conflicts are determined by the value of `OForkRefNum`. That is, if a fork is opened twice, the two open fork reference numbers are considered two different “users” regardless of whether they were opened for the same or different sessions.

All locks held by a user are unlocked when the user closes the fork. Unlocking a range makes it available to other users

for reading and writing. The server returns a result code of `kFPRangeNotLocked` if a user tries to unlock a range that was locked by another user or that was not locked at all.

To unlock a range, the `StartEndFlag` bit must be set to zero (start), `Length` must match the size of the range that was locked, and `Offset` must match the number of the first byte in the locked range. If the range was locked with `StartEndFlag` set to zero (start), use the same value of `Offset` to unlock the range that was used to lock the range. If the range was locked with the `StartEndFlag` bit set to 1 (end), set `Offset` to the value of `RangeStart` that was returned by the server. You cannot unlock part of range.

OS X supports memory-mapped files, but byte range locks should not be used in conjunction with them.

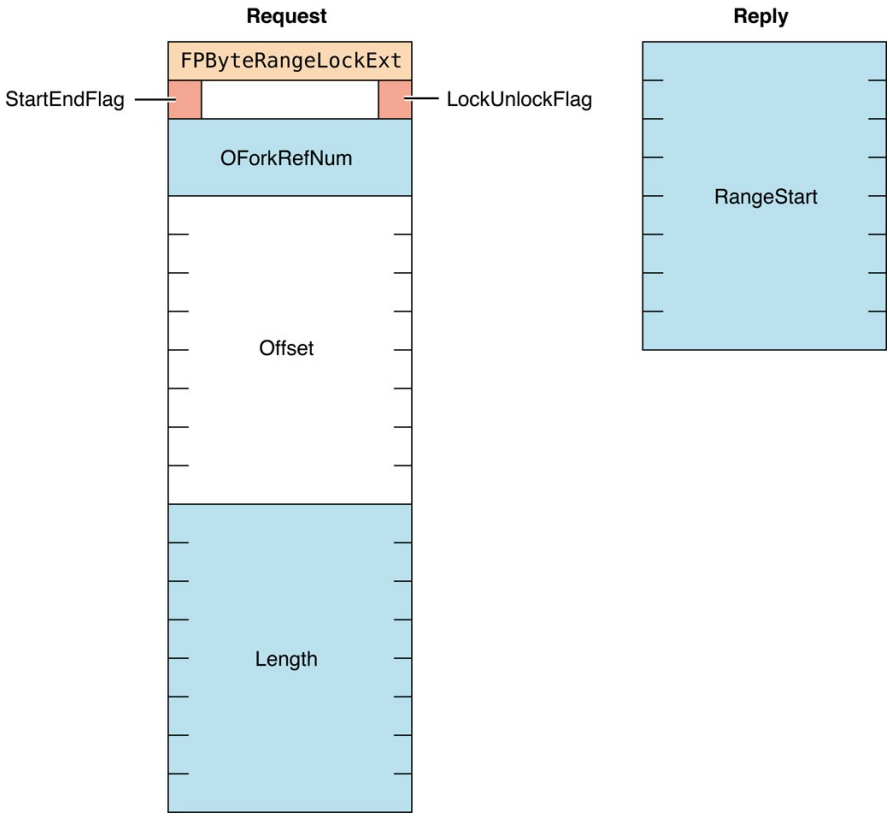
Table 6 lists the result codes for the `FPByteRangeLockExt` command.

Table 6 Result codes for the `FPByteRangeLockExt` command

Result code	Explanation
`kFPLockErr`	Some or all of the requested range is locked by another user.
`kFPMiscErr`	Non-AFP error occurred.
`kFPNoMoreLocks`	Server's maximum lock count has been reached.
`kFPParamErr`	Open fork reference number is unknown; a combination of the StartEndFlag bit and Offset parameters specifies a range that starts before byte zero.
`kFPRangeOverlap`	User tried to lock some or all of a range that the user has already locked.
`kFPRangeNotLocked`	User tried to unlock a range that is locked by another user or that is not locked at all.

Figure 7 shows the request and reply blocks for the `FPByteRangeLockExt` command.

Figure 7 Request and reply blocks for the `FPByteRangeLockExt` command



FPCatSearch

Searches a volume for files and directories that match specified criteria.

```
uint8_t CommandCode
uint8_t Pad
int16_t VolumeID
int32_t ReqMatches
int32_t Reserved
16 bytes CatalogPosition
int16_t FileRsltBitmap
int16_t DirectoryRsltBitmap
int32_t ReqBitmap
Specification1
Specification2
unsigned char Length
```

Parameters

CommandCode

`kFPCatSearch` (43).

Pad

Pad byte.

VolumeID

The ID of the volume to search.

Reserved

Reserved; must be zero.

ReqMatches

The maximum number of matches to return.

CatalogPosition

Current position in the catalog.

FileRsltBitmap

File bitmap describing the file parameters to get or null to get directory parameters only. Set the bit that corresponds to each desired parameter. This bitmap is the same as the `FileBitmap` parameter of the `FPGetFileDirParms` command with some restrictions described in the Discussion section. For bit definitions for this bitmap, see "File and Directory Bitmap."

DirectoryRsltBitmap

Directory bitmap describing the directory parameters to get or null to get file parameters only. Set the bit that corresponds to each desired parameter. This bitmap is the same as the `DirectoryBitmap` parameter of the `FPGetFileDirParms` command with some restrictions described in the Discussion section. For bit definitions for this bitmap, see "File and Directory Bitmap."

ReqBitmap

Directory and file parameters that are to be searched. For directory parameters only, see Figure 8. For file parameters only, see Figure 9. For directory and file parameters, see Figure 10.

Specification1

Search criteria lower bounds and values.

Specification2

Optional search criteria upper bounds and masks.

Length

Length of this request block.

Result

`kFPNoErr` if no error occurred. See Table 7 for possible result codes.

ReplyBlock

If the result code is `kFPNoErr`, the server returns a reply block. See Table 8 for the format of the reply block.

Discussion

This command searches a volume for files and directories that match the specified criteria and returns an array of records that describe the matches that were found. The criteria can include most parameters in the file bitmap, the directory bitmap, or both bitmaps, that are defined for the `FPGetFileDirParms` command. Parameters for the matching files and directories are returned. These parameters can also be any of those specified by the `FPGetFileDirParms` command.

The first word of the `CatalogPosition` parameter specifies whether the parameter denotes an actual catalog position or a hint. If the first word is zero, the search starts at the beginning of the volume. If the first word is non-zero, `CatalogPosition` is a actual catalog position and the search starts with this entry.

The `Specification1` and `Specification2` parameters are used together to specify the search parameters. These parameters are packed in the same order as the bits in `ReqBitmap`. All variable-length parameters (such as those containing names) are put at the end of each specification record. An offset is stored in the specification parameters to indicate where the actual variable-length parameter is located. This offset is measured from the start of the specification parameters (not including the length and filler bytes). Results are packed in the same way.

The fields in `Specification1` and `Specification2` have different uses:

- In the name field, `Specification1` holds the target string; `Specification2` must always have a null name field.
- In all date and length fields, `Specification1` holds the lowest value in the target range and `Specification2` holds the highest value in the target range.
- In file attributes and Finder Info fields, `Specification1` holds the target value and `Specification2` holds the bitwise mask that specifies which bits in that field in `Specification1` are relevant to the current search.

This command returns a result code of `kFPEOFErr` only when it has reached the end of the volume directory tree. For example, if the client requests ten matches, the server may return only four matches, without returning an error. The client should then send a request for six (ten minus four) more matches, using the same `CatalogPosition` value that was received in the previous reply. This process continues until the originally requested matches are received or a `kFPEOFErr` is returned. If this command returns a result code of `kFPCatalogChanged`, the client cannot continue the search. The client must restart the search by setting the first word of `CatalogPosition` to zero.

This command returns parameters for files, directories or both, depending on the value of the `FileRsltBitmap` and `DirectoryRsltBitmap` parameters. If `FileRsltBitmap` is null, this command assumes that you are not searching for files. Likewise, if `DirectoryRsltBitmap` is null, this command assumes that you are not searching for directories. If both parameters are non-zero, this command searches for files and directories. Note that if you are searching for both files and directories, certain restrictions apply with regard to the parameters that are searched. The rest of this section describes these restrictions.

The `ReqBitmap` parameter specifies the directory and file parameters to be searched. The low-order word of `ReqBitmap` is the same as low-order word of the file bitmap and the directory bitmap used by the `FPGetFileDirParms` command, with the exception of the Short Name parameter, which cannot be searched. The high bit of the high-order word of `ReqBitmap` indicates whether the search should match on full names or partial names (0 = full name, 1 = partial name). There is no equivalent to the fsSBNegate bit used by the Macintosh File Manager's `PBCatSearch` function.

Figure 8 shows parameters this command can search when it is searching directories only.

Figure 8 Parameters `FPCatSearch` searches when searching directories only

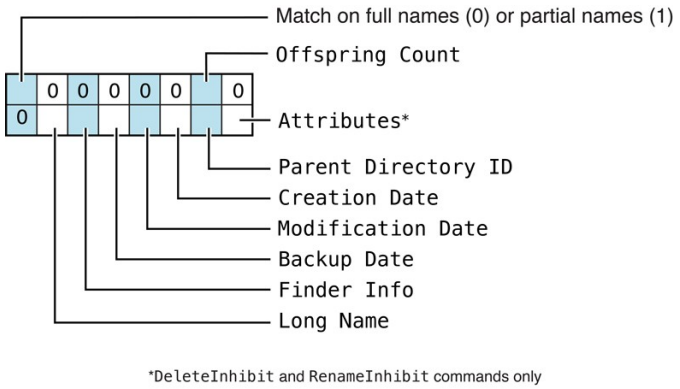


Figure 9 shows parameters this command can search when it is searching files only.

Figure 9 Parameters `FPCatSearch` searches when searching files only

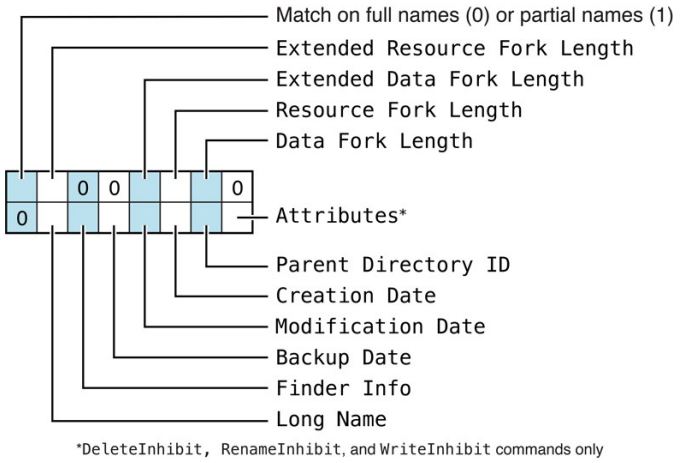
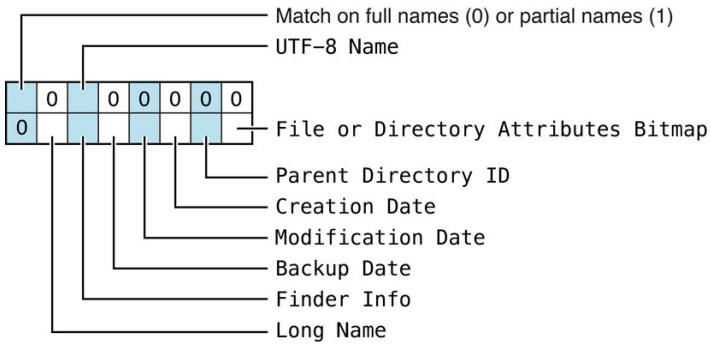


Figure 10 shows parameters this command can search when it is searching both directories and files.

Figure 10 Parameters `FPCatSearch` searches when searching directories and files



Before sending this command, the user must call `FPOpenVol` for the volume that is to be searched.

To return all files and directories that match the specified criteria, the user must have Read Only or Read & Write privileges for all directories. This command skips directories for which the user does not have Read Only or Read & Write privileges.

Table 7 lists the result codes for the `FPCatSearch` command.

Table 7 Result codes for the `FPCatSearch` command

Result code	Explanation
`kFPCallNotSupported`	Server does not support this command.
`kFPCatalogChanged`	Catalog has changed and CatalogPosition may be invalid. No matches were returned.
`kFPEOFErr`	No more matches.
`kFPMiscErr`	Non-AFP error occurred.
`kFPParamErr`	Session reference number, Volume ID, or pathname type is unknown; pathname is null or bad.

Table 8 describes the reply block for the `FPCatSearch` command.

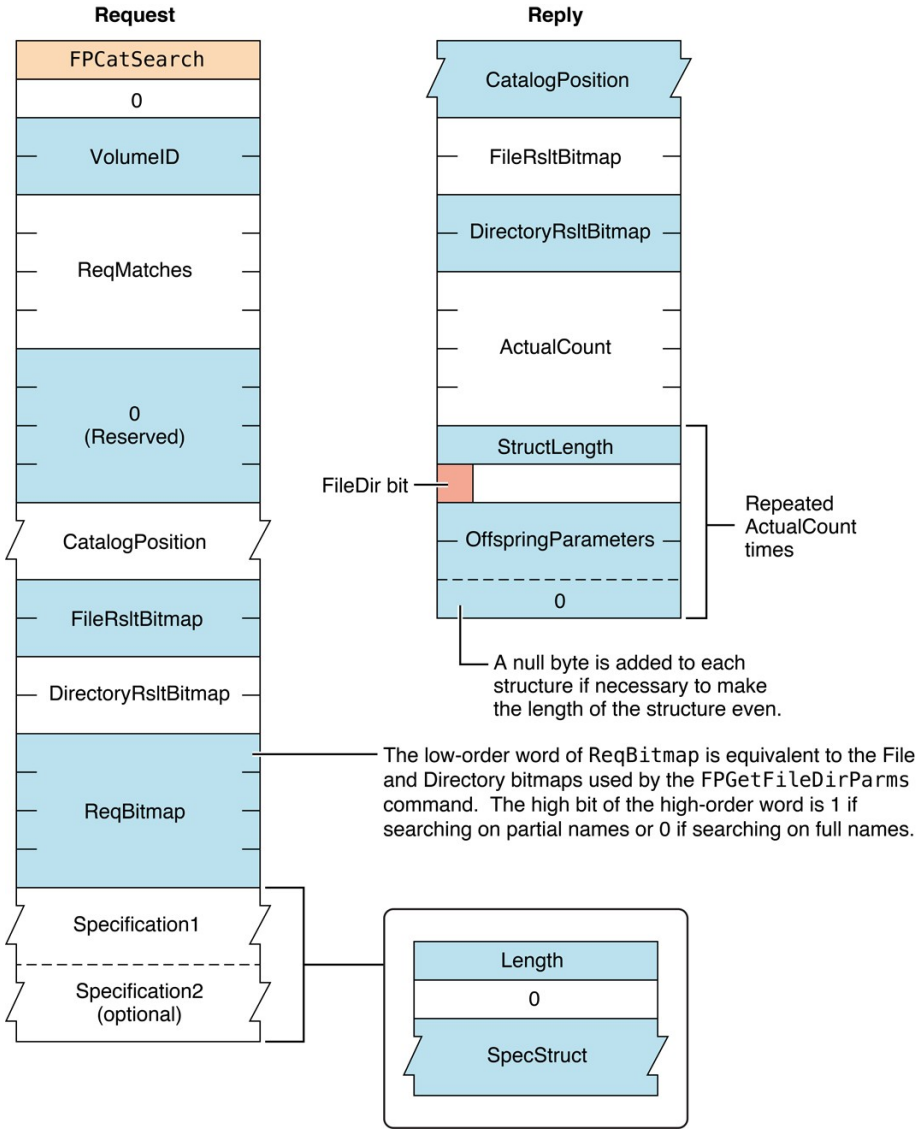
Table 8 Reply block for the `FPCatSearch` command

Name and size	Data
`CatalogPosition` (16 bytes)	Current position in the catalog.
`FileRsltBitmap` (`int16_t`)	Copy of the input bitmap.
`DirectoryRsltBitmap` (`int16_t`)	Copy of the input bitmap.
`ActualCount` (`uint8_t`)	Number of `ResultsRecord` structures that follow.
Zero or more `ResultsRecord` structures	Array of `ResultsRecord` structures describing the matches that were found and having the following structure: `StructLength` (`uint8_t`)—Unsigned length of this structure, not including this byte or the byte for the `FileDir` bit (but including the one-byte pad if applicable). `FileDir` (bit 7 of a one-byte value)—Whether the record is for a file (0) or

	directory (1). `OffspringParameters`—The matching Long Name, Parent Directory ID, or both with a trailing null byte if necessary to make the entire structure end on an even boundary.

Figure 11 shows the request and reply blocks for the `FPCatSearch` command.

Figure 11 Request and reply blocks for the `FPCatSearch` command



Availability

Deprecated in AFP 3.x. Use `FPCatSearchExt` instead.

FPCatSearchExt

Searches a volume for files and directories that match specified criteria.

```
uint8_t CommandCode
uint8_t Pad
```

```
int16_t VolumeID
int32_t ReqMatches
int32_t Reserved
16 bytes CatalogPosition
int16_t FileRsltBitmap
int16_t DirectoryRsltBitmap
int32_t ReqBitmap
Specification1
Specification2
unsigned char Length
```

Parameters

CommandCode

`kFPCatSearchExt` (67).

Pad

Pad byte.

VolumeID

Volume ID.

ReqMatches

Maximum number of matches to return.

Reserved

Reserved; must be zero.

CatalogPosition

Current position in the catalog.

FileRsltBitmap

Bitmap describing the file parameters to get or null to get directory parameters only. Set the bit that corresponds to each desired parameter. This bitmap is the same as the `FileBitmap` parameter of the `FPGetFileDirParms` command with some restrictions described later in this section. For bit definitions for this bitmap, see “File and Directory Bitmap.”

DirectoryRsltBitmap

Bitmap describing the directory parameters to get or null to get file parameters only. Set the bit that corresponds to each desired parameter. This bitmap is the same as the `DirectoryBitmap` parameter of the `FPGetFileDirParms` command with some restrictions described later in this section. For bit definitions for this bitmap, see “File and Directory Bitmap.”

ReqBitmap

Directory and file parameters that are to be searched. For directory parameters, see Figure 12. For file parameters, see Figure 13. For directory and file parameters, see Figure 14.

Specification1

Search criteria lower bounds and values.

Specification2

Optional search criteria upper bounds and masks.

Length

Length of this request block.

Result

`kFPNoErr` if no error occurred. See Table 9 for possible result codes.

ReplyBlock

If the result code is `kFPNoErr`, the server returns a reply block. See Table 10 for the format of the reply block.

Discussion

This command searches a volume for files and directories that match the specified criteria and returns an array of records that describe the matches that were found.

This command differs from the `FPCatSearch` command in that `FPCatSearchExt` is prepared to handle longer search results that can occur when searching volumes that are more than 4 GB in size.

The criteria can include most parameters in the file bitmap, the directory bitmap, or both bitmaps, that are defined for the `FPGetFileDirParms` command. Parameters for the matching files and directories are returned. These parameters can also be any of those specified by the `FPGetFileDirParms` command.

The first word of the `CatalogPosition` parameter specifies whether the parameter denotes an actual catalog position or a hint. If the first word is zero, the search starts at the beginning of the volume. If the first word is non-zero, `CatalogPosition` is an actual catalog position and the search starts with this entry.

The `Specification1` and `Specification2` parameters are used together to specify the search parameters. These parameters are packed in the same order as the bits in the `ReqBitmap`. All variable-length parameters (such as those containing names) are put at the end of each specification record. An offset is stored in the specification parameters to indicate where the actual variable-length parameter is located. This offset is measured from the start of the specification parameters (not including the length and filler bytes). Results are packed in the same way.

The fields in `Specification1` and `Specification2` have different uses:

- In the name field, `Specification1` holds the target string; `Specification2` must always have a null name field.
- In all date and length fields, `Specification1` holds the lowest value in the target range and `Specification2` holds the highest value in the target range.
- In Attributes and Finder Info fields, `Specification1` holds the target value and `Specification2` holds the bitwise mask that specifies which bits in that field in `Specification1` are relevant to the current search.

This command returns a result code of `kFPEOFErr` only when it has reached the end of the volume directory tree. For example, if the client requests ten matches, the server may return only four matches, without returning an error. The client should then send a request for six (ten minus four) more matches, using the same `CatalogPosition` value that was received in the previous reply. This process continues until the originally requested matches are received or a result code of `kFPEOFErr` is returned. If this command returns a result code of `kFPCatalogChanged`, the client cannot continue the search. The client must restart the search by setting the first word of `CatalogPosition` to zero.

This command returns parameters for files, directories or both, depending on the value of the `FileRsltBitmap` and `DirectoryRsltBitmap` parameters. If `FileRsltBitmap` is null, this command assumes that you are not searching for files. Likewise, if DirectoryRsltBitmap is null, this command assumes that you are not searching for directories. If both parameters are non-zero, this command searches for files and directories. Note that if you are searching for both files and directories, certain restrictions apply with regard to the parameters that are searched. The rest of this section describes these restrictions.

The `ReqBitmap` parameter specifies the directory and file parameters to be searched. The low-order word of `ReqBitmap` is the same as low-order word of the file bitmap and the directory bitmap in `FPGetFileDirParms`, with the exception of the Short Name parameter, which cannot be searched. The high bit of the high-order word of `ReqBitmap` indicates whether the search should match on full names or partial names (0 = full name, 1 = partial name). There is no equivalent to the fsSBNegate bit used by the Macintosh File Manager's `PBCatSearch` function.

Figure 12 shows parameters this command can search when it is searching directories only.

Figure 12 Parameters `FPCatSearchExt` searches when searching directories only

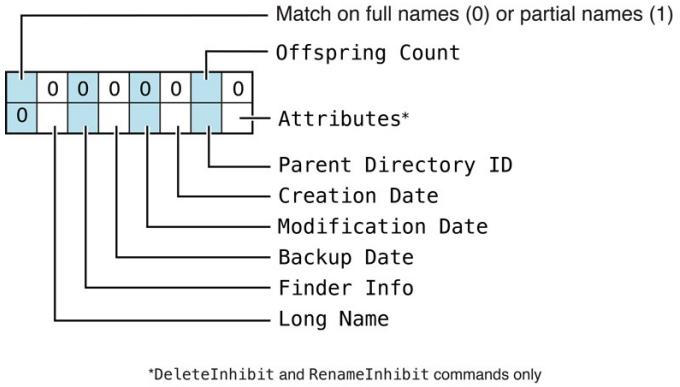


Figure 9 shows parameters this command can search when it is searching files only.

Figure 13 Parameters `FPCatSearchExt` searches when searching files only

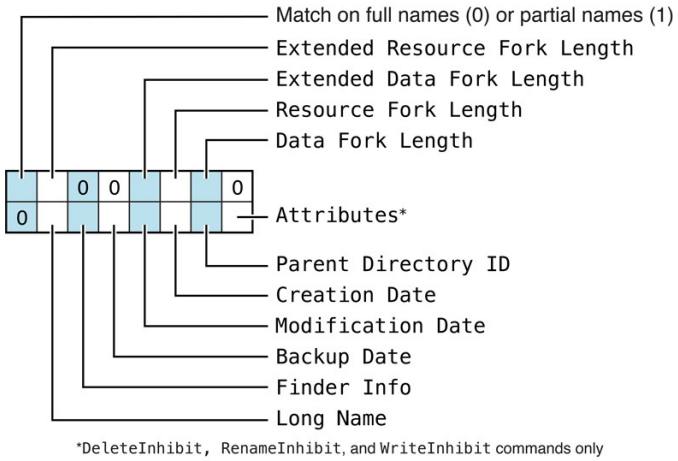
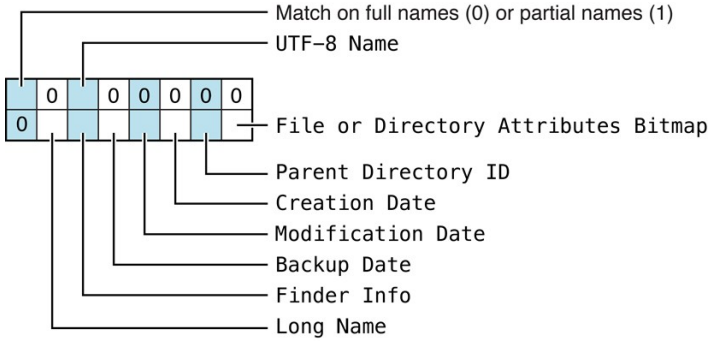


Figure 10 shows parameters this command can search when it is searching both directories and files.

Figure 14 Parameters `FPCatSearchExt` searches when searching directories and files



Before sending this command, the user must call `FPOpenVol` for the volume that is to be searched.

To return all files and directories that match the specified criteria, the user must have Read Only or Read & Write privileges for all directories. This command skips directories for which the user does not have Read Only or Read & Write privileges.

Table 9 lists the result codes for the `FPCatSearchExt` command.

Table 9 Result codes for the `FPCatSearchExt` command

Result code	Explanation
`kFPCallNotSupported`	Server does not support this command.
`kFPCatalogChanged`	Catalog has changed and CatalogPosition may be invalid. No matches were returned.
`kFPEOFErr`	No more matches.
`kFPMiscErr`	Non-AFP error occurred.
`kFPParamErr`	Session reference number, Volume ID, or pathname type is unknown; pathname is null or bad.

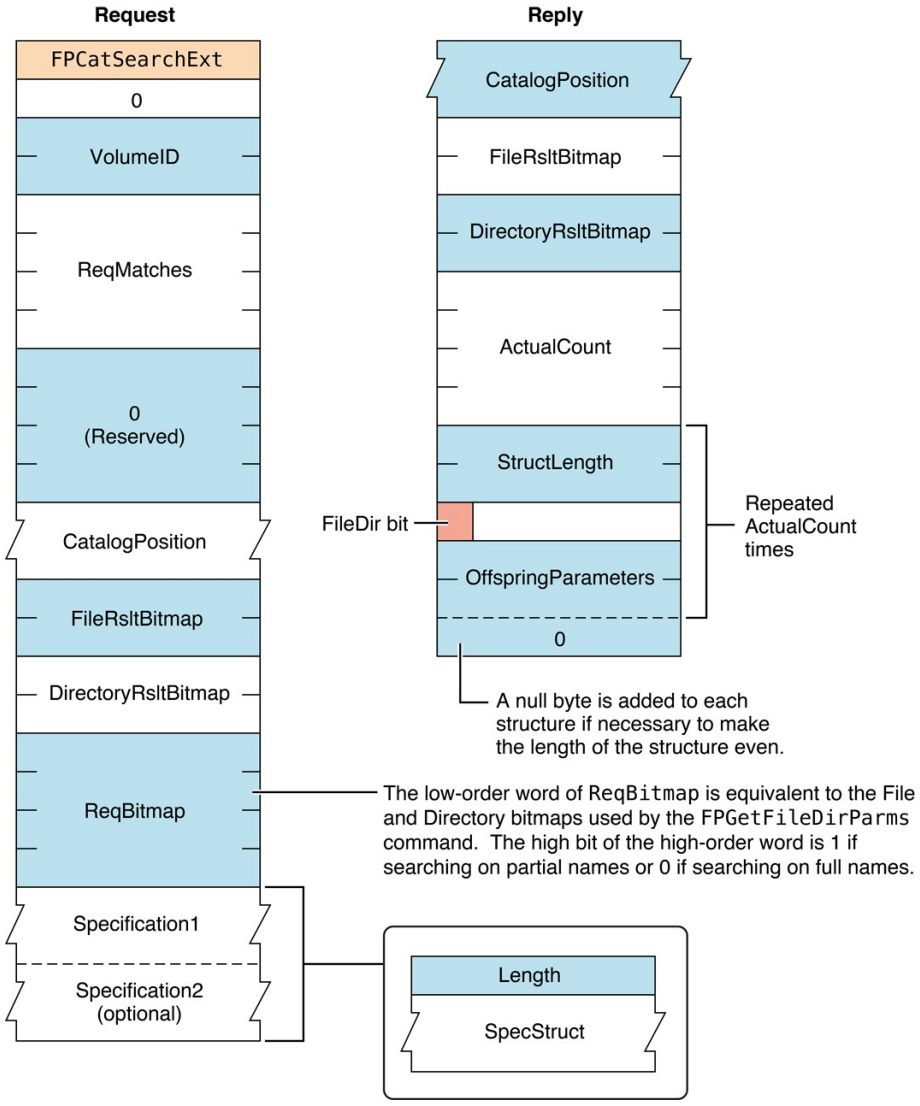
Table 10 describes the reply block for the FPCatSearchExt command.

Table 10 Reply block for the FPCatSearchExt command

Name and size	Data
CatalogPosition (16 bytes)	Current position in the catalog.
FileRsltBitmap (int16_t)	Copy of the input bitmap.
DirectoryRsltBitmap (int16_t)	Copy of the input bitmap.
ActualCount (int16_t)	Number of ResultsRecord structures that follow.
Zero or more ResultsRecord structures	Array of ResultsRecord structures describing the matches that were found and having the following structure: StructLength (uint16_t)—Unsigned length of this structure, not including the length bytes , the byte for the FileDir bit, or the following pad byte. FileDir (bit 7 of a one-byte value)—Whether the record is for a file (0) or directory (1). Results—The matching Long Name, Parent Directory ID, or both with a trailing null byte if necessary to make the entire structure end on an even boundary.

Figure 15 shows the request and reply blocks for the FPCatSearchExt command.

Figure 15 Request and reply blocks for the FPCatSearchExt command



The file and directory result bitmaps are described in “File and Directory Bitmap.”

In the reply block, `StructLength` is the length of the `Parameters` block after it, not including the `StructLength` field, the `FileDir` bitfield byte, or the pad byte (if applicable). Thus, to find the start of the next set of results, take the current position (before `StructLen`) and add `StructLen`, add `2` (for the `structLen` field itself), add `2` (for the `FileDir` byte and `Pad` byte).

FPChangePassword

Allows users to change their passwords.

```
uint8_t CommandCode
uint8_t Pad
string UAM
string UserName
UserAuthInfo
```

Parameters

CommandCode

`kFPChangePassword` (36).

Pad

Pad byte.

UAM

String specifying the UAM to uses.

UserName

Name of the user whose password is to be changed. Starting with AFP 3.0, `UserName` is two bytes with each byte set to zero. The first byte indicates a zero length string, and the second byte is a pad byte.

UserAuthInfo

UAM-specific information.

Result

`kFPNoErr` if no error occurred. See Table 11 for other possible result codes.

ReplyBlock

Varies depending on the UAM. For any UAM that uses multi-stage authentication, this command returns `kFPAuthContinue` and provides a reply block used in the subsequent authentication stage. See "Apple Filing Protocol Concepts" in *Apple Filing Protocol Programming Guide* for details on each specific UAM.

Discussion

If the UAM is `Cleartxt Passwrd`, the AFP client sends the server the user's name plus the user's old and new eight-byte passwords in cleartext. The server looks up the password for that user. If it matches the old password sent in the packet, the new password is saved for that user. For more information on the Cleartext Password UAM, see the section "Cleartext Password" in the "Introduction" section.

If the UAM is `Randnum Exchange`, DES is used to encrypt and decrypt passwords. The AFP client sends the server the user name, the user's old eight-byte password encrypted with the user's new eight-byte password, and the user's new eight-byte password encrypted with the user's old eight-byte password. The server looks up the password for that user, uses that password as a key to decrypt the new password, and uses the result to decrypt the old password. If the final result matches what the server knows to be the old password, the new password is saved for that user. For more information on the Random Number Exchange UAM, see the section "Random Number Exchange" in the "Introduction" section.

When using the Random Number Exchange UAM, be sure to append null bytes to any password that is less than eight bytes so that the resulting password has a length of eight bytes.

If the user logged in using the Two-Way Random Number Exchange UAM, the client uses the Randnum UAM for changing the user's password.

If the UAM is `DHCAST128`, the AFP client must call `FPChangePassword` twice. The first time, the AFP client calls `FPChangePassword` to send the user name and a random number that has been encrypted. The server replies with an ID, a random number, and a nonce/server signature value encrypted by a session key. The AFP client calls `FPChangePassword` again, this time sending the user name and the ID returned by the server. The client also sends the nonce incremented by one, the new password, and the old password, all encrypted by the session key. For information on using the DHX UAM to change passwords, see the section "DHX and Changing a Password" in the "Introduction" section.

Servers are not required to support this command. Call `FPGetSrvrInfo` to determine whether a server supports this command.

The user may not have been granted the ability to change his or her password. Granting the ability to change a password is an administrative function and is beyond the scope of this protocol specification.

Table 11 lists the result codes for the `FPChangePassword` command.

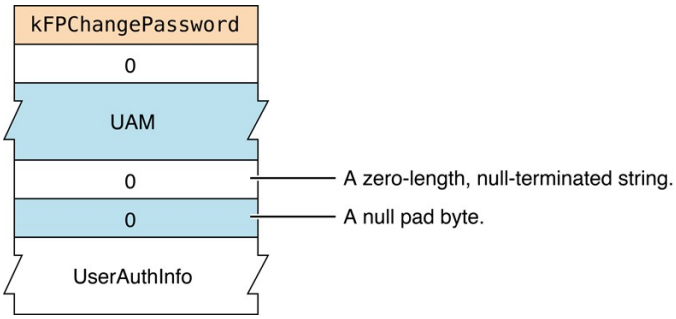
Table 11 Result codes for the `FPChangePassword` command

Result code	Explanation
`kFPNoErr`	No error occurred.
`kFPCallNotSupported`	Server does not support this command.

kFPUserNotAuth	UAM failed (the specified old password doesn't match) or no user is logged in yet for the specified session.
kFPBadUAM	Specified UAM is not a UAM that FPChangePassword supports.
kFPAccessDenied	User does not have the access privileges required to use this command.
kFPParamErr	User name is null, exceeds the UAM's user name length limit, or does not exist.
kFPPwdSameErr	User attempted to change his or her password to the same password that he or she previously had. This error occurs only if the password expiration feature is enabled on the server.
kFPPwdTooShortErr	User password is shorter than the server's minimum password length, or user attempted to change password to a password that is shorter than the server's minimum password length.
kFPPwdPolicyErr	New password does not conform to the server's password policy.
kFPMiscErr	Non-AFP error occurred.

Figure 16 shows the request block for the FPChangePassword command.

Figure 16 Request block for the FPChangePassword command



FPCloseDir

Closes a directory and invalidates its Directory ID.

```
uint8_t CommandCode
uint8_t Pad
int16_t VolumeID
int32_t DirectoryID
```

Parameters

CommandCode

kFPCloseDir (3).

Pad

Pad byte.

VolumeID

Volume ID.

DirectoryID

Directory ID.

Result

`kFPNoErr` if no error occurred, `kFPParamErr` if the session reference number, Volume ID, or Directory ID is unknown, or `kFPMiscErr` if an error occurred that is not specific to AFP.

ReplyBlock

None.

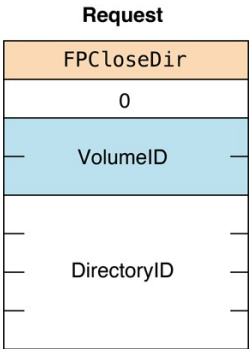
Discussion

This command invalidates the Directory ID specified by DirectoryID.

This command should be used only for variable Directory ID volumes. The user must have previously called `FPOpenVol` for this volume and `FPOpenDir` for this directory.

Figure 17 shows the request block for the `FPCloseDir` command.

Figure 17 Request block for the `FPCloseDir` command



Availability

Deprecated. This is not used by the OS X client because variable directory ID volumes are no longer supported. Directory IDs are assumed to be unique and are not reused when a directory is deleted.

FPCloseDT

Closes a volume's Desktop database.

```
uint8_t CommandCode
uint8_t Pad
int16_t DTRefNum
```

Parameters

CommandCode

`kFPCloseDT` (49).

Pad

Pad byte.

DTRefNum

Desktop database reference number.

Result

`kFPNoErr` if no error occurred, `kFPParamErr` if the session reference number or the Desktop database reference number is unknown, or `kFPMiscErr` if an error occurred that is not specific to AFP.

ReplyBlock

None.

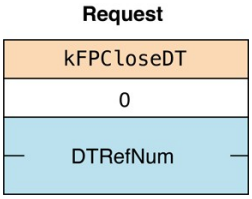
Discussion

This command invalidates the Desktop database reference number specified by `DTRefNum`.

The user must first have sent a successful `FPOpenDT` command.

Figure 18 shows the request block for the `FPCloseDT` command.

Figure 18 Request block for the `FPCloseDT` command



Availability

Deprecated. The Desktop Database Manager no longer exists in Mac OS v.10.6 and later.

FPCloseFork

Closes a fork.

```
uint8_t CommandCode
uint8_t Pad
int16_t OForkRefNum
```

Parameters

CommandCode

`kFPCloseFork` (4).

Pad

Pad byte.

OForkRefNum

Open fork reference number.

Result

`kFPNoErr` if no error occurred, `kFPParamErr` if the session reference number or the open fork reference number is unknown, or `kFPMiscErr` if an error occurred that is not specific to AFP.

ReplyBlock

None.

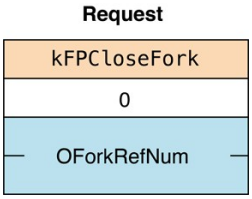
Discussion

This command causes the server to flush and close the specified fork, invalidating the open fork reference number. If the fork was written to, the file's modification date is set to the server's clock.

The user must first have sent a successful `FPOpenFork` command.

Figure 19 shows the request block for the `FPCloseFork` command.

Figure 19 Request block for the `FPCloseFork` command



FPCloseVol

Closes a volume.

```
uint8_t CommandCode
uint8_t Pad
int16_t VolumeID
```

Parameters

CommandCode

`kFPCloseVol` (2).

Pad

Pad byte.

VolumeID

Volume ID.

Result

`kFPNoErr` if no error occurred, `kFPParamErr` if the session reference number or the Volume ID is unknown, or `kFPMiscErr` if an error occurred that is not specific to AFP.

ReplyBlock

None.

Discussion

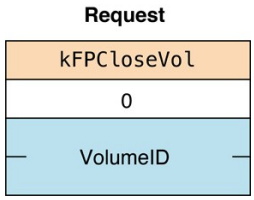
This command invalidates the specified Volume ID but does not necessarily close all open files on a volume before closing the volume, so you should close all open files before calling FPCloseVol.

The user must first have sent a successful `FPOpenVol` command for this volume.

After sending this command, the user can send no other commands for this volume without opening the volume again.

Figure 20 shows the request block for the `FPCloseVol` command.

Figure 20 Request block for the `FPCloseVol` command



FPCopyFile

Copies a file from one location to another on the same file server.

```
uint8_t CommandCode
uint8_t Pad
int16_t SourceVolumeID
int32_t SourceDirectoryID
int16_t DestVolumeID
int32_t DestDirectoryID
uint8_t SourcePathType
string SourcePathname
uint8_t DestPathType
string DestPathname
uint8_t NewType
string NewName
```

Parameters

CommandCode
`kFPCopyFile` (5).

Pad
Pad byte.

SourceVolumeID
Source Volume ID.

SourceDirectoryID
Source ancestor Directory ID.

DestVolumeID
Destination Volume ID.

DestDirectoryID
Destination ancestor Directory ID.

SourcePathType
Type of names in `SourcePathname`. See "Path Type Constants" for possible values.

SourcePathname
Pathname of the file to be copied (cannot be null). `SourcePathname` is a string if it contains Short or Long Names or an AFPName if it contains a UTF-8–encoded path.

DestPathType
Type of names in `DestPathname`. See "Path Type Constants" for possible values.

DestPathname
Pathname to the destination parent directory (may be null). `DestPathname` is a string if it contains Short or Long Names or an AFPName if it contains a UTF-8–encoded path.

NewType
Type of name in `NewName`. See "Path Type Constants" for possible values.

NewName
Name to be given to the copy (may be null).

Result
`kFPNoErr` if no error occurred. See Table 12 for other possible result codes.

ReplyBlock
None.

Discussion
This command copies a file to a new location on the server. The source and destination can be on the same or on different volumes.

The server tries to open the source file for Read, DenyWrite access. If this fails, the server returns `kFPDenyConflict` as the result code. If the server successfully opens the file, it copies the file to the directory specified by the destination parameters.

The copy is given the name specified by the `NewName` parameter. If `NewName` is null, the server gives the copy the same name as the original. The file's other name (Long, Short) is generated as described in the section "Catalog Node Names" in Chapter 1. A unique file number is assigned to the file. The server also sets the file's Parent ID to the Directory ID of the destination parent directory. All other file parameters remain the same as the source file's parameters. The modification date of the destination parent directory is set to the server's lock.

The user must have search access to all ancestors of the source file, except the source parent directory, and read access to the source parent directory. Further, the user must have search or write access to all ancestors of the destination file, except the destination parent directory, and write access to the destination parent directory.

This command is optional and may not be supported by all servers.

See the Character Encoding section of "Apple Filing Protocol Concepts" in *Apple Filing Protocol Programming Guide* for additional details about the UTF-8 encoding used by AFP.

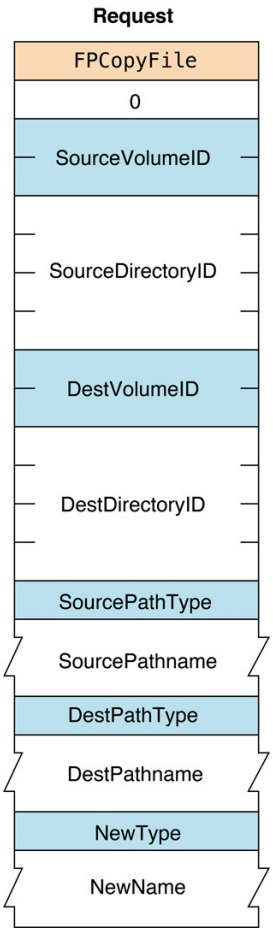
Table 12 lists the result codes for the `FPCopyFile` command.

Table 12 Result codes for the `FPCopyFile` command

Result code	Explanation
`kFPAccessDenied`	User does not have the access privileges required to read the file or write to the destination.
`kFPCallNotSupported`	Server does not support this command.
`kFPDenyConflict`	File cannot be opened for Read, DenyWrite.
`kFPDiskFull`	No more space exists on the destination volume.
`kFPMiscErr`	Non-AFP error occurred.
`kFPObjectExists`	File or directory of the name specified by `NewName` already exists in the destination parent directory.
`kFPObjectNotFound`	The source file does not exist; ancestor directory is unknown.
`kFPObjectTypeErr`	Source parameters point to a directory.
`kFPParamErr`	Open fork reference number is unknown; a combination of the `StartEndFlag` bit and `Offset` parameters specifies a range that starts before byte zero.

Figure 21 shows the request block for the `FPCopyFile` command.

Figure 21 Request block for the `FPCopyFile` command



FPCreateDir

Creates a new directory.

```
uint8_t CommandCode
uint8_t Pad
int16_t VolumeID
int32_t DirectoryID
uint8_t PathType
string Pathname
```

Parameters

CommandCode

`kFPCreateDir` (6).

Pad

Pad byte.

VolumeID

Volume ID.

DirectoryID

Ancestor Directory ID.

PathType

Type of names in `Pathname`. See “Path Type Constants” for possible values.

Pathname

Pathname, including the name of the new directory (cannot be null). `Pathname` is a string if it contains Short or Long Names or an AFPName if it contains a UTF-8–encoded path. See the Character Encoding section of “Apple Filing

Protocol Concepts" in *Apple Filing Protocol Programming Guide* for additional details about the UTF-8 encoding used by AFP.

Result

`kFPNoErr` if no error occurred. See Table 13 for other possible result codes.

ReplyBlock

If the result code is `kFPNoErr`, the server returns an `int32_t`, called `NewDirectoryID`, containing the Directory ID of the new directory in the reply block.

Discussion

This command creates an empty directory having the name specified by the `Pathname` parameter. The file server assigns the directory a unique Directory ID and returns it in the reply block. The new directory's Owner ID is set to the User ID of the user sending the command, and its Group ID is set to the ID of the user's Primary Group ID, if a primary group has been specified for the user.

The new directory's privileges are initially set to read, write, and search for the owner, with no privileges for a group or Everyone. Finder information is set to zero and all directory attributes are initially cleared. The directory's creation and modification dates, as well as the modification date of the parent directory, are set to the server's clock. The directory's backup date is set to $80000000, signifying that the directory has never been backed up. The directory's other names are generated as described in the section "Catalog Node Names" in Chapter 1.

The user must have search or write access to all ancestors, except this directory's parent directory, as well as write access to the parent directory.

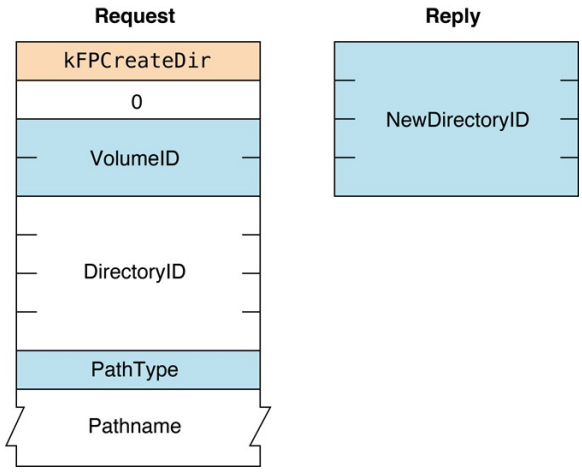
Table 13 lists the result codes for the `FPCreateDir` command.

Table 13 Result codes for the `FPCreateDir` command

Result code	Explanation
`kFPAccessDenied`	User does not have the access privileges required to use this command.
`kFPDiskFull`	No more space exists on the volume.
`kFPFlatVol`	Volume is flat and does not support directories.
`kFPMiscErr`	Non-AFP error occurred.
`kFPObjectNotFound`	Ancestor directory is unknown.
`kFPObjectExists`	File or directory of the specified name already exists.
`kFPParamErr`	Session reference number, Volume ID, or pathname is null or invalid.
`kFPVolLocked`	Destination volume is read-only.

Figure 22 shows the request and reply blocks for the `FPCreateDir` command.

Figure 22 Request and reply blocks for the `FPCreateDir` command



FPCreateFile

Creates a new file.

```
uint8_t CommandCode
uint8_t Flag
int16_t VolumeID
int32_t DirectoryID
uint8_t PathType
string Pathname
```

Parameters

CommandCode

`kFPCreateFile` (7).

Flag

Bit 7 of the `Flag` parameter is the CreateFlag bit, where 0 indicates a soft create and 1 indicates a hard create.

VolumeID

Volume ID.

DirectoryID

Ancestor Directory ID.

PathType

Type of names in `Pathname`. See “Path Type Constants” for possible values.

Pathname

Pathname, including the name of the new file (cannot be null). `Pathname` is a string if it contains Short or Long Names or an AFPName if it contains a UTF-8–encoded path. See the Character Encoding section of “Apple Filing Protocol Concepts” in *Apple Filing Protocol Programming Guide* for additional details about the UTF-8 encoding used by AFP.

Result

`kFPNoErr` if no error occurred. See Table 14 for other possible result codes.

ReplyBlock

None.

Discussion

This command creates an empty file having the name specified by `Pathname`. For a soft create, if a file by that name already exists, the server returns a result code of `kFPObjectExists`. Otherwise, it creates a new file and assigns it the name specified by `Pathname`. A unique file number is assigned to the file. Finder information is set to zero, and all file attributes are initially cleared. The file’s creation and modification dates, and the modification date of the file’s parent of the file’s parent directory, are set to the server’s clock. The file’s backup date is set to $80000000, signifying that this file has never been backed up. The file’s other names are generated as described in the section “Catalog Node

Names" in Chapter 1. The lengths of both of the file's forks are set to zero.

For a soft create, the user must have search or write access to all ancestors, except this file's parent directory, as well as write access to the parent directory. For a hard create, the user must have search access to all ancestors, except the parent directory, as well as read and write access to the parent directory.

For a hard create, if the file already exists and is not open, the file is deleted and then recreated. All file parameters (including the creation date) are reinitialized as described above.

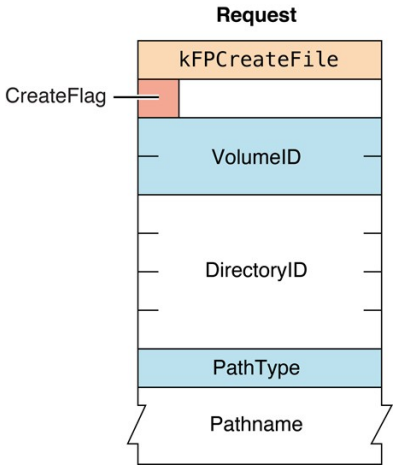
Table 14 lists the result codes for the `FPCreateFile` command.

Table 14 Result codes for the `FPCreateFile` command

Result code	Explanation
`kFPAccessDenied`	User does not have the access privileges required to use this command.
`kFPDiskFull`	No more space exists on the volume.
`kFPFileBusy`	If attempting a hard create, the file already exists and is open.
`kFPMiscErr`	Non-AFP error occurred.
`kFPObjectExists`	If attempting a soft create, a file of the specified name already exists.
`kFPObjectNotFound`	Ancestor directory is unknown.
`kFPVolLocked`	Destination volume is read-only.
`kFPParamErr`	Session reference number, Volume ID, or pathname is null or invalid.

Figure 23 shows the request block for the `FPCreateFile` command.

Figure 23 Request block for the `FPCreateFile` command



FPCreateID

Creates a unique File ID for a file.

```
uint8_t CommandCode
```

```
uint8_t Pad
int16_t VolumeID
int32_t DirectoryID
uint8_t PathType
string Pathname
```

Parameters

CommandCode

`kFPCreateID` (39).

Pad

Pad byte.

VolumeID

Volume ID.

DirectoryID

Directory ID of the directory in which the file is to be created.

PathType

Type of names in `Pathname`. See "Path Type Constants" for possible values.

Pathname

Name of the file that is the target of the File ID (that is, the filename of the file for which a File ID is being created). `Pathname` is a string if it contains Short or Long Names or an AFPName if it contains a UTF-8–encoded path. See the Character Encoding section of "Apple Filing Protocol Concepts" in *Apple Filing Protocol Programming Guide* for additional details about the UTF-8 encoding used by AFP.

Result

`kFPNoErr` if no error occurred. See Table 15 for other possible result codes.

ReplyBlock

None.

Discussion

File IDs provide a way to keep track of a file even if its name or location changes. The scope of a File ID is limited to the files on a volume. File IDs cannot be used across volumes.

The AFP server should take steps to ensure that every File ID is unique and that no File ID is reused once it has been deleted.

The user must have the Read Only or the Read & Write privilege to use this command.

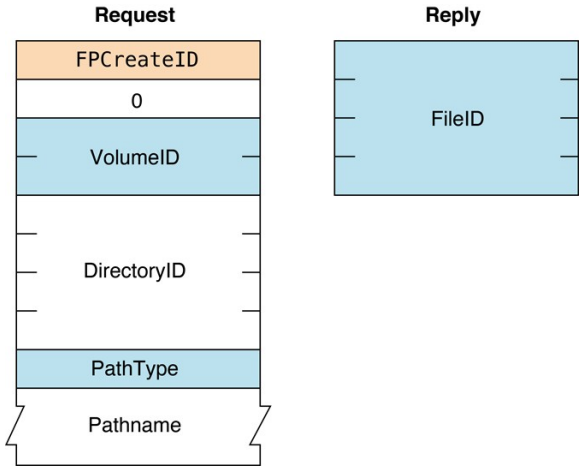
Table 15 lists the result codes for the `FPCreateID` command.

Table 15 Result codes for the `FPCreateID` command

Result code	Explanation
`kFPMiscErr`	Non-AFP error occurred.
`kFPObjectNotFound`	Target file does not exist.
`kFPObjectTypeErr`	Object defined was a directory, not a file.
`kFPParamErr`	Session reference number, Volume ID, or pathname type is unknown; pathname is null or bad.
`kFPVolLocked`	Destination volume is read-only.

Figure 24 shows the request block for the `FPCreateID` command.

Figure 24 Request block for the `FPCreateID` command



Availability

Deprecated. OS X AFP clients assume that all files and directories have assigned IDs that are unique and are not reused when the item is deleted.

FPDelete

Deletes a file or directory.

```
uint8_t CommandCode
uint8_t Pad
int16_t VolumeID
int32_t DirectoryID
uint8_t PathType
string Pathname
```

Parameters

CommandCode

`kFPDelete` (8).

Pad

Pad byte.

VolumeID

Volume ID.

DirectoryID

Ancestor Directory ID.

PathType

Type of names in `Pathname`. See “Path Type Constants” for possible values.

Pathname

Pathname of the file or directory to be deleted (may be null if a directory is to be deleted). `Pathname`is a string if it contains Short or Long Names or an AFPName if it contains a UTF-8–encoded path. See the Character Encoding section of “Apple Filing Protocol Concepts” in *Apple Filing Protocol Programming Guide* for additional details about the UTF-8 encoding used by AFP.

Result

`kFPNoErr` if no error occurred. See Table 16 for other possible result codes.

ReplyBlock

None.

Discussion

When deleting a directory, the server checks to see if it contains any offspring. If a directory contains offspring, the server returns a result code of `kFPDirNotEmpty`. If a file that is to be deleted is open by any user, the server returns a result code of `kFPFileBusy`. The modification date of the parent directory of the deleted file or directory is set to the servers clock.

The user must have search access to all ancestors except the file or directory's parent directory, as well as write access to the parent directory. If a directory is being deleted, the user must also have search access to the parent directory; for a file, the user must also have read access to the parent directory.

The AFP server identifies the Network Trash Folder by name, and that name is not localized in international versions of the Mac OS because it is invisible.

Table 16 lists the result codes for the `FPDelete` command.

Table 16 Result codes for the `FPDelete` command

Result code	Explanation
`kFPAccessDenied`	User does not have the access privileges required to use this command.
`kFPDirNotEmpty`	Directory is not empty.
`kFPMiscErr`	Non-AFP error occurred.
`kFPObjectLocked`	File or directory is marked DeleteInhibit.
`kFPObjectNotFound`	Input parameters do not point to an existing file or directory.
`kFPObjectTypeErr`	Object defined was a directory, not a file.
`kFPParamErr`	Session reference number, Volume ID, or pathname type is unknown; pathname is invalid.
`kFPVolLocked`	Volume is read-only.

Figure 25 shows the request block for the `FPDelete` command.

Figure 25 Request block for the `FPDelete` command

Request block for the FPDelete command

FPDeleteID

Invalidates all instances of the specified File ID.

```
uint8_t CommandCode
uint8_t Pad
int16_t VolumeID
int32_t FileID
```

Parameters

CommandCode

`kFPDeleteID` (40).

Pad

Pad byte.

VolumeID

Volume ID.

FileID
File ID that is to be deleted.

Result
`kFPNoErr` if no error occurred. See Table 17 for other possible result codes.

ReplyBlock
None.

Discussion

This command deletes the specified File ID, which was created by an earlier call to `FPCreateID`.

The user must have the Read Only or the Read & Write access privilege to use this command.

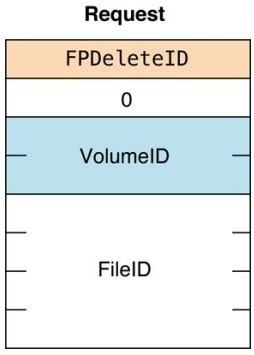
Table 17 lists the result codes for the `FPDeleteID` command.

Table 17 Result codes for the `FPDeleteID` command

Result code	Explanation
`kFPAccessDenied`	User does not have the access privileges required to use this command.
`kFPCallNotSupported`	Server does not support this command.
`kFPIDNotFound`	File ID was not found. (No file thread exists.)
`kFPMiscErr`	Non-AFP error occurred.
`kFPObjectNotFound`	Target file does not exist. The File ID is deleted anyway.
`kFPObjectTypeErr`	Object defined was a directory, not a file.
`kFPParamErr`	Session reference number, Volume ID, or pathname type is unknown; pathname is null or bad.
`kFPVolLocked`	Volume is read-only.

Figure 26 shows the request block for the `FPDeleteID` command.

Figure 26 Request block for the `FPDeleteID` command



Availability

Deprecated. Not used by OS X AFP client. OS X AFP clients assume that all files and directories have assigned IDs that are unique and are not reused when the item is deleted.

FPDisconnectOldSession

Disconnects an old session and transfers its resources to a new session.

```
uint8_t CommandCode
uint8_t Pad
int16_t Type
int32_t TokenLength
string Token
```

Parameters

CommandCode

`kFPDisconnectOldSession` (65).

Pad

Pad byte.

Type

Always zero (`0`) currently.

TokenLength

Length of `Token`.

Token

Token previous obtained by calling `FPGetSessionToken`.

Result

`kFPNoErr` if no error occurred, `kFPCallNotSupported` if the server does not support this command, or `kFPMiscErr` if an error occurred that is not specific to AFP.

ReplyBlock

None.

Discussion

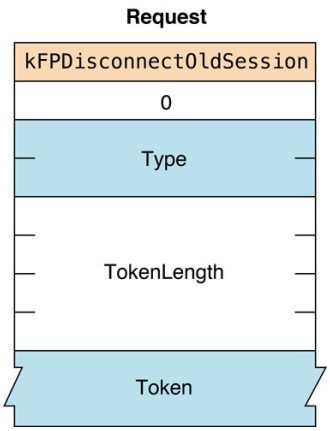
This command disconnects the session identified by the Token parameter, which was obtained by previously calling `FPGetSessionToken` and transfers the resources of the old session to the new session.

The AFP client calls this command when the session it previously established was inadvertently disconnected, it successfully establishes a new session, and it is able to restore the state of the previous session. If the AFP client cannot successfully reestablish the state of the previous session, it should call this command, log out, and report the failure to the local operating system.

If the AFP client successfully reestablishes the state of the previous session, it should call this command again to get a new session token.

Figure 27 shows the request block for the `FPDisconnectOldSession` command.

Figure 27 Request block for the `FPDisconnectOldSession` command



FPEnumerate

Lists the contents of a directory.

```
uint8_t CommandCode
uint8_t Pad
int16_t VolumeID
int32_t DirectoryID
int16_t FileBitmap
int16_t DirectoryBitmap
int16_t ReqCount
int16_t StartIndex
int16_t MaxReplySize
uint8_t PathType
string Pathname
```

Parameters

CommandCode

`kFPEnumerate` (9).

Pad

Pad byte.

VolumeID

Volume ID.

DirectoryID

Identifier for the directory to list.

FileBitmap

Bitmap describing the parameters to return if the enumerated offspring is a file. Set the bit that corresponds to each desired parameter. This bitmap is the same as the `FileBitmap` parameter of the `FPGetFileDirParms` command and can be null. For bit definitions for this bitmap, see “File and Directory Bitmap.”

DirectoryBitmap

Bitmap describing the parameters to return if the enumerated offspring is a directory. Set the bit that corresponds to each desired parameter. This bitmap is the same as the `DirectoryBitmap` parameter of the `FPGetFileDirParms` command and can be null. For bit definitions for this bitmap, see “File and Directory Bitmap.”

ReqCount

Maximum number of `ResultsRecord` structures for which information is to be returned.

StartIndex

Directory offspring index.

MaxReplySize

Maximum size of the reply block.

PathType

Type of names in `Pathname`. See “Path Type Constants” for possible values.

Pathname

Pathname to the desired directory. `Pathname` is a string if it contains Short or Long Names or an AFPName if it contains a UTF-8–encoded path. See the Character Encoding section of “Apple Filing Protocol Concepts” in *Apple Filing Protocol Programming Guide* for additional details about the UTF-8 encoding used by AFP.

Result

`kFPNoErr` if no error occurred. See Table 18 for other possible result codes.

ReplyBlock

If the result code is `kFPNoErr`, the server returns a reply block. See Table 19 for the format of the reply block.

Discussion

This command enumerates a directory as specified by the input parameters. This command differs from the `FPEnumerateExt` and `FPEnumerateExt2` commands in that it is not able to handle values that may be returned when volumes are larger than 4 GB in size.

If FileBitmap is null, only directory offspring are enumerated, and StartIndex can range from one to the total number of directory offspring. Similarly, if DirectoryBitmap is null, only file offspring are enumerated, and StartIndex can range from one to the total number of file offspring. If both bitmaps have bits set, StartIndex can range from one to the total number of offspring. In this case, offspring structures for both files and directories are returned. These structures are not returned in any particular order.

This command is completed when the number of structures specified by ReqCount has been inserted into the reply block, when the reply block is full, or when no more offspring exist to be enumerated. No partial offspring structures are returned.

The server retrieves the specified parameters for each enumerated offspring and packs them, in bitmap order, in structures in the reply block. The server inserts one copy of the input bitmaps before all of the structures.

The server needs to keep variable-length parameters, such as Long Name and Short Name, at the end of each structure. In order to do this, the server represents variable-length parameters in the bitmap order as fixed-length offsets (integers). Each offset is measured from the start of the parameters in each structure (not from the start of the bitmap or the start of the header bytes) to the start of the variable-length parameter. Each structure is padded (suffixed) with a null byte if necessary to make its length even.

If this command returns a result code of kFPNoErr, all structures in the reply block are valid. If any error result code is returned, no valid offspring structures are in the reply block.

If the OffSpring Count bit in the directory bitmap is set, the server adjusts the Offspring Count of each directory to reflect the access rights the user has to that directory. For example, if a particular directory contains three file and two directory offspring, the server returns the Offspring Count as 2 if the user has only search access to the directory, 3 if the user has only read access to the directory, or 5 if the user has both search and read access to the directory.

The user must have search access to all ancestors except this directory. In addition, the user needs search access to this directory in order to enumerate directory offspring and read access in order to enumerate file offspring.

Enumerating a large directory may require the sending of several FPEnumerate commands. During that time, other users may add to or delete from the directory, so enumeration can miss offspring or return duplicate offspring. To enumerate a directory accurately, enumerate until a kFPObjectNotFound result code is returned and then filter out duplicate entries.

A given offspring is not guaranteed to occupy the same index number in the parent directory from one enumeration to the next.

Table 18 lists the result codes for the FPEnumerate command.

Table 18 Result codes for the FPEnumerate command

Result code	Explanation
kFPAccessDenied	User does not have the access privileges required to use this command.
kFPBitmapErr	Attempt was made to retrieve a parameter that cannot be retrieved by this command, an attempt was made to retrieve the Directory ID for a directory on a variable Directory ID volume, or both bitmaps are empty.
kFPDirNotFound	Input parameters do not point to an existing directory.
kFPMiscErr	Non-AFP error occurred.
kFPObjectNotFound	No more offspring exist to be enumerated.
kFPObjectTypeErr	Input parameters point to a file.
kFPParamErr	Session reference number, Volume ID, or pathname type is unknown, pathname is bad, or MaxReplySize is too small to hold a single offspring structure.

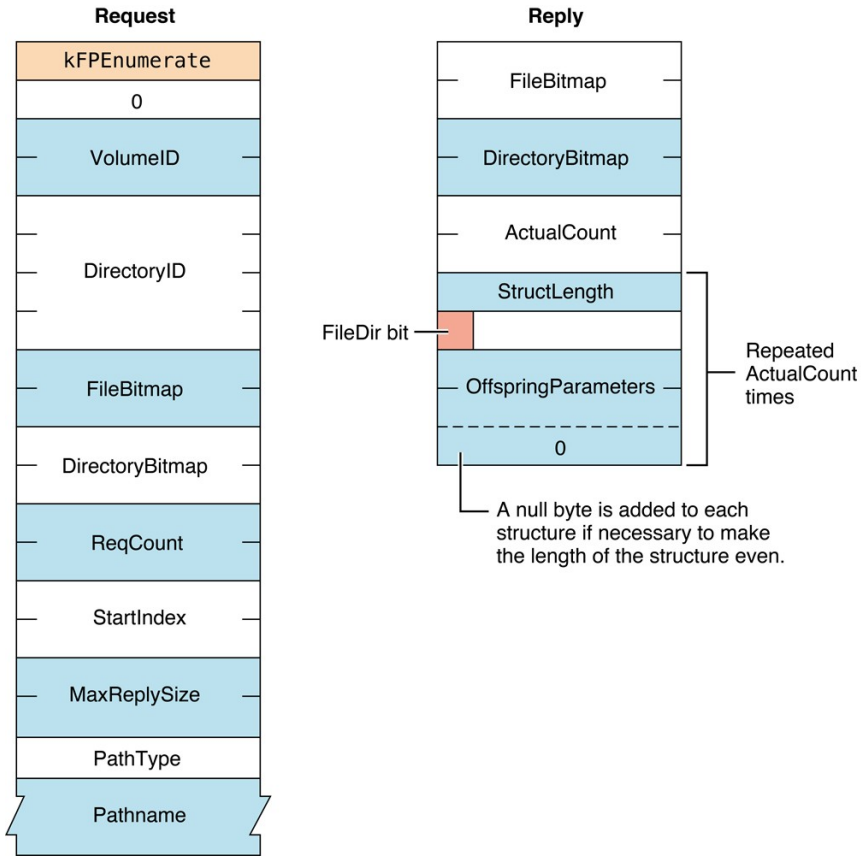
Table 19 describes the reply block for the `FPEnumerate`command.

Table 19 Reply block for the `FPEnumerate` command

Name and size	Data
`FileBitmap` (`int16_t`)	Copy of the input parameter.
`DirectoryBitmap` (`int16_t`)	Copy of the input parameter.
`ActualCount` (`int16_t`)	Actual number of `ResultsRecord` structures returned.
Zero or more `ResultsRecord` structures	Array of `ResultsRecord` structures consisting of the following fields: `StructLength` (`uint8_t`) — Unsigned length of this structure, including this byte and the byte for the `FileDir` bit. `FileDir` (bit) — Flag indicating whether the `OffspringParameters` field describes a file (0) or a directory (1). `OffspringParameters` — Packed in bitmap order, with a trailing null byte if necessary to make the length of the entire structure an even number.

Figure 28 shows the request and reply blocks for the `FPEnumerate` command.

Figure 28 Request and reply blocks for the `FPEnumerate` command



Availability

Deprecated. Use `FPEnumerateExt2` instead.

FPEnumerateExt

Lists the contents of a directory.

```
uint8_t CommandCode
uint8_t Pad
int16_t VolumeID
int32_t DirectoryID
int16_t FileBitmap
int16_t DirectoryBitmap
int16_t ReqCount
int16_t StartIndex
int16_t MaxReplySize
uint8_t PathType
string Pathname
```

Parameters

CommandCode

`kFPEnumerateExt` (66).

Pad

Pad byte.

VolumeID

Volume ID.

DirectoryID

Identifier for the directory to list.

FileBitmap

Bitmap describing the parameters to return if the enumerated offspring is a file. Set the bit that corresponds to each desired parameter. This bitmap is the same as the `FileBitmap` parameter of the `FPGetFileDirParms` command and can be null. For bit definitions for this bitmap, see “File and Directory Bitmap.”

DirectoryBitmap

Bitmap describing the parameters to return if the enumerated offspring is a directory. Set the bit that corresponds to each desired parameter. This bitmap is the same as the `DirectoryBitmap` parameter of the `FPGetFileDirParms` command and can be null. For bit definitions for this bitmap, see “File and Directory Bitmap.”

ReqCount

Maximum number of `ResultsRecord` structures for which information is to be returned.

StartIndex

Directory offspring index.

MaxReplySize

Maximum size of the reply block.

PathType

Type of names in `Pathname`. See “Path Type Constants” for possible values.

Pathname

Pathname to the desired directory. `Pathname` is a string if it contains Short or Long Names or an AFPName if it contains a UTF-8–encoded path. See the Character Encoding section of “Apple Filing Protocol Concepts” in *Apple Filing Protocol Programming Guide* for additional details about the UTF-8 encoding used by AFP.

Result

`kFPNoErr` if no error occurred. See Table 20 for other possible result codes.

ReplyBlock

If the result code is `kFPNoErr`, the server returns a reply block. See Table 21 for the format of the reply block.

Discussion

This command enumerates a directory as specified by the input parameters. This command differs from the

FPEnumerate command in that this command is prepared to handle values that may be returned when volumes are larger than 4 GB in size. This command also differs from the FPEnumerateExt2 command in that StartIndex and MaxReplySize are int16_t values (instead of int32_t), which may limit the number of entries in a single directory that can be listed. The reply block for this command is the same as the reply block for FPEnumerateExt2.

If FileBitmap is null, only directory offspring are enumerated, and StartIndex can range from one to the total number of directory offspring. Similarly, if the DirectoryBitmap is null, only file offspring are enumerated, and StartIndex can range from one to the total number of file offspring. If both bitmaps have bits set, StartIndex can range from one to the total number of offspring. In this case, offspring structures for both files and directories are returned. These structures are not returned in any particular order.

This command is completed when the number of structures specified by ReqCount has been inserted into the reply block, when the reply block is full, or when no more offspring exist to be enumerated. No partial offspring structures are returned.

The server retrieves the specified parameters for each enumerated offspring and packs them, in bitmap order, in structures in the reply block. The server inserts one copy of the input bitmaps before all of the structures.

The server needs to keep variable-length parameters, such as Long Name and Short Name, at the end of each structure. In order to do this, the server represents variable-length parameters in the bitmap order as fixed-length offsets (integers). Each offset is measured from the start of the parameters in each structure (not from the start of the bitmap or the start of the header bytes) to the start of the variable-length parameter. Each structure will be padded (suffixed) with a null byte if necessary to make its length even.

If kFPNoErr is returned, all structures in the reply block are valid. If any error result code is returned, no valid offspring structures exist in the reply block.

If the OffSpring Count bit in the directory bitmap is set, the server adjusts the Offspring Count of each directory to reflect what access rights the user has to that directory. For example, if a particular directory contains three file and two directory offspring, the server will return its Offspring Count as 2 if the user has only search access to the directory, 3 if the user has only read access to the directory, or 5 if the user has both search and read access to the directory.

The user must have search access to all ancestors except this directory. In addition, the user needs search access to this directory in order to enumerate directory offspring and read access in order to enumerate file offspring.

Enumerating a large directory may require the sending of several FPEnumerateExt commands. During that time, other users may add to or delete from the directory, so enumeration can miss offspring or return duplicate offspring. To enumerate a directory accurately, enumerate until a kFPObjectNotFound result code is returned and then filter out duplicate entries.

A given offspring is not guaranteed to occupy the same index number in the parent directory from one enumeration to the next.

Table 20 lists the result codes for the FPEnumerateExt command.

Table 20 Result codes for the FPEnumerateExt command

Result code	Explanation
kFPAccessDenied	User does not have the access privileges required to use this command.
kFPBitmapErr	Attempt was made to retrieve a parameter that cannot be retrieved by this command, an attempt was made to retrieve the Directory ID for a directory on a variable Directory ID volume, or both bitmaps are empty.
kFPDirNotFound	Input parameters do not point to an existing directory.
kFPMiscErr	Non-AFP error occurred.
kFPObjectNotFound	No more offspring exist to be enumerated.

kFPObjectTypeErr	Input parameters point to a file.
kFPParamErr	Session reference number, Volume ID, or pathname type is unknown, pathname is bad, or MaxReplySize is too small to hold a single offspring structure.

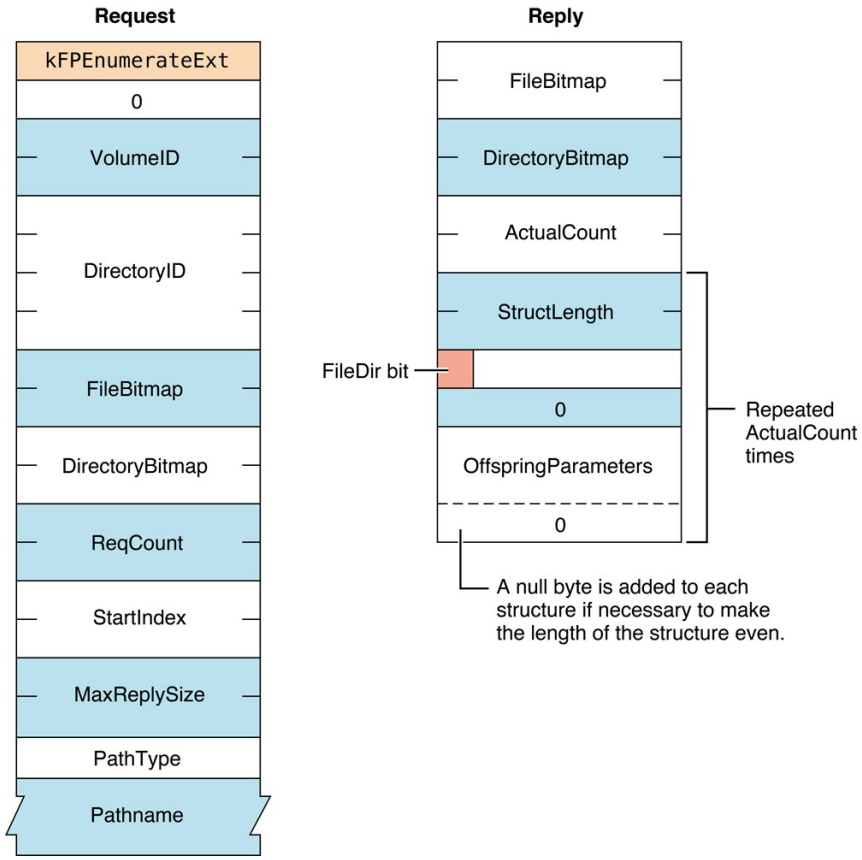
Table 21 describes the reply block for the FPEnumerateExt command.

Table 21 Reply block for the FPEnumerateExt command

Name and size	Data
DirectoryBitmap (int16_t)	Copy of the input parameter.
ActualCount (int16_t)	Actual number of ResultsRecord structures returned.
Zero or more ResultsRecord structures	An array of ResultsRecord structure consisting of the following fields: StructLength (uint8_t) — An unsigned length of this structure, including this byte, the byte containing the FileDir bit. FileDir (bit) — Flag indicating whether the OffspringParameters field describes a file (0) or a directory (1). Pad (uint8_t) — Always zero. OffspringParameters — Packed in bitmap order, with a trailing null byte if necessary to make the length of the entire structure an even number.

Figure 29 shows the request and reply blocks for the FPEnumerateExt command.

Figure 29 Request and reply blocks for the FPEnumerateExt command



Availability

Deprecated. Use `FPEnumerateExt2` instead.

FPEnumerateExt2

Lists the contents of a directory.

```
uint8_t CommandCode
uint8_t Pad
int16_t VolumeID
int32_t DirectoryID
int16_t FileBitmap
int16_t DirectoryBitmap
int16_t ReqCount
int32_t StartIndex
int32_t MaxReplySize
uint8_t PathType
string Pathname
```

Parameters

CommandCode

`kFPEnumerateExt2` (68).

Pad

Pad byte.

VolumeID

Volume ID.

DirectoryID

Identifier for the directory to list.

FileBitmap

Bitmap describing the parameters to return if the enumerated offspring is a file. Set the bit that corresponds to each desired parameter. This bitmap is the same as the `FileBitmap` parameter of the `FPGetFileDirParms` command and can be null. For bit definitions for this bitmap, see "File and Directory Bitmap."

DirectoryBitmap

Bitmap describing the parameters to return if the enumerated offspring is a directory. Set the bit that corresponds to each desired parameter. This bitmap is the same as the `DirectoryBitmap` parameter of the `FPGetFileDirParms` command and can be null. For bit definitions for this bitmap, see "File and Directory Bitmap."

ReqCount

Maximum number of `ResultsRecord` structures for which information is to be returned.

StartIndex

Directory offspring index.

StartIndex

Maximum size of the reply block.

PathType

Type of names in `Pathname`. See "Path Type Constants" for possible values.

Pathname

Pathname to the desired directory. `Pathname` is a string if it contains Short or Long Names or an AFPName if it contains a UTF-8–encoded path. See the Character Encoding section of "Apple Filing Protocol Concepts" in *Apple Filing Protocol Programming Guide* for additional details about the UTF-8 encoding used by AFP.

Result

`kFPNoErr` if no error occurred. See Table 22 for other possible result codes.

ReplyBlock

If the result code is `kFPNoErr`, the server returns a reply block. See Table 23 for the format of the reply block.

Discussion

This command enumerates a directory as specified by the input parameters. This command differs from the `FPEnumerateExt` command in that `StartIndex` and `MaxReplySize` are `int32_t` values instead of int16_t, thereby allowing this command to list more entries in a single directory. The reply block for this command is the same as the reply block for the `FPEnumerateExt` command.

If `FileBitmap` is null, only directory offspring are enumerated, and `StartIndex` can range from one to the total number of directory offspring. Similarly, if the `DirectoryBitmap` is null, only file offspring are enumerated, and `StartIndex` can range from one to the total number of file offspring. If both bitmaps have bits set, `StartIndex` can range from one to the total number of offspring. In this case, offspring structures for both files and directories are returned. These structures are not returned in any particular order.

This command is completed when the number of structures specified by `ReqCount` has been inserted into the reply block, when the reply block is full, or when no more offspring exist to be enumerated. No partial offspring structures are returned.

The server retrieves the specified parameters for each enumerated offspring and packs them, in bitmap order, in structures in the reply block. The server inserts one copy of the input bitmaps before all of the structures.

The server needs to keep variable-length parameters, such as Long Name and Short Name, at the end of each structure. In order to do this, the server represents variable-length parameters in the bitmap order as fixed-length offsets (integers). Each offset is measured from the start of the parameters in each structure (not from the start of the bitmap or the start of the header bytes) to the start of the variable-length parameter. Each structure will be padded (suffixed) with a null byte if necessary to make its length even.

If `kFPNoErr` is returned, all structures in the reply block are valid. If any error result code is returned, no valid offspring structures exist in the reply block.

If the OffSpring Count bit in the directory bitmap is set, the server adjusts the Offspring Count of each directory to reflect what access rights the user has to that directory. For example, if a particular directory contains three file and two directory offspring, the server will return its Offspring Count as 2 if the user has only search access to the directory, 3 if the user has only read access to the directory, or 5 if the user has both search and read access to the

directory.

The user must have search access to all ancestors except this directory. In addition, the user needs search access to this directory in order to enumerate directory offspring and read access in order to enumerate file offspring.

Enumerating a large directory may require the sending of several `FPEnumerateExt2` commands. During that time, other users may add to or delete from the directory, so enumeration can miss offspring or return duplicate offspring. To enumerate a directory accurately, enumerate until a `kFPObjectNotFound` result code is returned and then filter out duplicate entries.

A given offspring is not guaranteed to occupy the same index number in the parent directory from one enumeration to the next.

Table 22 lists the result codes for the `FPEnumerateExt2` command.

Table 22 Result codes for the `FPEnumerateExt2` command

Result code	Explanation
`kFPAccessDenied`	User does not have the access privileges required to use this command.
`kFPBitmapErr`	Attempt was made to retrieve a parameter that cannot be retrieved by this command, an attempt was made to retrieve the Directory ID for a directory on a variable Directory ID volume, or both bitmaps are empty.
`kFPDirNotFound`	Input parameters do not point to an existing directory.
`kFPMiscErr`	Non-AFP error occurred.
`kFPObjectNotFound`	No more offspring exist to be enumerated.
`kFPObjectTypeErr`	Input parameters point to a file.
`kFPParamErr`	Session reference number, Volume ID, or pathname type is unknown, pathname is bad, or `MaxReplySize` is too small to hold a single offspring structure.

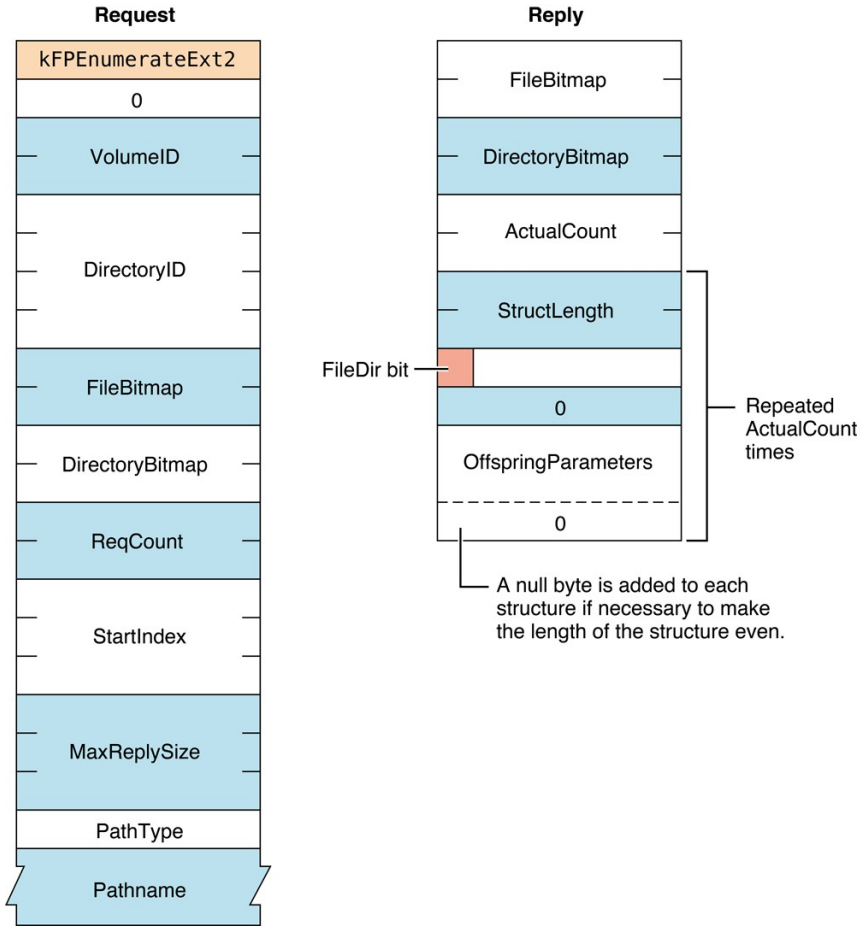
Table 23 describes the reply block for the `FPEnumerateExt2` command.

Table 23 Reply block for the `FPEnumerateExt2` command

Name and size	Data
`FileBitmap` (`int16_t`)	Copy of the input parameter.
`DirectoryBitmap` (`int16_t`)	Copy of the input parameter.
`ActualCount` (`int16_t`)	Actual number of `ResultsRecord` structures returned.
Zero or more `ResultsRecord` structures	An array of `ResultsRecord` structures, each consisting of the following fields: `StructLength` (`uint8_t`) — Unsigned length of this structure, including this byte and the byte for the `FileDir` bit. `FileDir` (bit) — Flag indicating whether the `OffspringParameters` field describes a file (0) or a directory (1). Pad (`uint8_t`) — Always zero. `OffspringParameters` — Packed in bitmap order, with a trailing null byte if necessary to make the length of the entire structure an even number.

Figure 30 shows the request and reply blocks for the `FPEnumerateExt2` command.

Figure 30 Request and reply blocks for the `FPEnumerateExt2` command



FPExchangeFiles

Exchanges file metadata between two files.

```
uint8_t CommandCode
uint8_t Pad
int16_t VolumeID
int32_t SourceDirectoryID
int32_t DestDirectoryID
uint8_t SourcePathType
string SourcePathname
uint8_t DestPathType
string DestPathname
```

Parameters

CommandCode

`kFPExchangeFiles` (42).

Pad

Pad byte.

VolumeID

Volume ID.

SourceDirectoryID

Identifier of the directory containing the source file.

DestDirectoryID
Identifier of the directory containing the destination file.

SourcePathType
Type of names in `SourcePathname`. See “Path Type Constants” for possible values.

SourcePathname
Pathname of the source file. `SourcePathname` is a string if it contains Short or Long Names or an AFPName if it contains a UTF-8–encoded path.

DestPathType
Type of names in `DestPathname`. See “Path Type Constants” for possible values.

DestPathname
Pathname of the source file. `DestPathname` is a string if it contains Short or Long Names or an AFPName if it contains a UTF-8–encoded path.

Result
`kFPNoErr` if no error occurred. See Table 24 for other possible result codes.

ReplyBlock
None.

Discussion

This command atomically exchanges all file system metadata (file name, file ID, security information, and so on) between two files. The recommended way to perform a "Save" or "Save as" operation on a file on an AFP server is to write a new file, then send an `FPExchangeFiles` command to exchange the new file with the original.

To use this command, both files must exist on the same volume.

The files being exchanged can be open or closed. If the files are open, existing references to either file effectively become references to the other file. Thus reads and writes continue to see the same data as before, but `fstat` and similar operations return different results.

If you open either file after calling `FPExchangeFiles`, from your application’s perspective, it appears that the contents of the two files have been swapped (though this is not precisely what happened).

Figure 31 shows the results of an exchange operation between two files named Blue and Red.

Figure 31 Example of exchanging files

Notice that only the filename, Parent Directory ID, File ID, and creation dates are exchanged. Byte-range locks and deny modes still apply to the same file reference number and data.

The user must have the Read & Write privilege for both files in order to use this command.

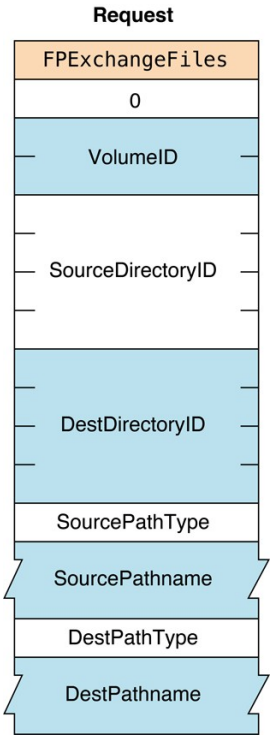
Table 24 lists the result codes for the `FPExchangeFiles` command.

Table 24 Result codes for the `FPExchangeFiles` command

Result code	Explanation
`kFPAccessDenied`	User does not have the access privileges required to use this command.
`kFPBadIDErr`	File ID is not valid.
`kFPCallNotSupported`	Server does not support this command.
`kFPIDNotFound`	File ID was not found. (No file thread exists.)
`kFPMiscErr`	Non-AFP error occurred.
`kFPObjectTypeErr`	Object defined was a directory, not a file.
`kFPParamErr`	Session reference number, Volume ID, or pathname type is unknown; pathname is null or bad.

Figure 32 shows the request block for the `FPExchangeFiles` command.

Figure 32 Request block for the `FPExchangeFiles` command



See the Character Encoding section of "Apple Filing Protocol Concepts" in *Apple Filing Protocol Programming Guide* for additional details about the UTF-8 encoding used by AFP.

FPFlush

Writes any volume data that has been modified.

```
uint8_t CommandCode
uint8_t Pad
int16_t VolumeID
```

Parameters

CommandCode

`kFPFlush` (10).

Pad

Pad byte.

VolumeID

Volume ID.

Result

`kFPNoErr` if no error occurred, `kFPParamErr` if the session reference number or Volume ID is invalid, or `kFPMiscErr` if an error occurred that is not specific to AFP.

ReplyBlock

None.

Discussion

This command writes to disk as much changed information as possible including

- all forks opened by the user
- volume catalog information changed by the user

- any updated volume data structures

AFP does not specify that the server must perform all of these functions. Therefore, users should not rely on the server to perform any particular function.

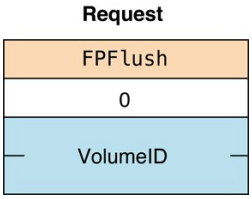
The volume's modification date may change as a result of this command, but uses should not rely on it; updating of the date is implementation-dependent. If no volume information was changed since the last `FPFlush` command, the date may or may not change.

Notice that only the filename, Parent Directory ID, File ID, and creation dates are exchanged. Byte-range locks and deny modes still apply to the same file reference number and data.

The user must have the Read & Write privilege for both files in order to use this command.

Figure 33 shows the request block for the `FPFlush` command.

Figure 33 Request block for the `FPFlush` command



FPFlushFork

Writes any data buffered from previous write commands.

```
uint8_t CommandCode
uint8_t Pad
int16_t OForkRefNum
```

Parameters

CommandCode

`kFPFlushFork` (11).

Pad

Pad byte.

OForkRefNum

Open fork reference number.

Result

`kFPNoErr` if no error occurred, `kFPParamErr` if the session reference number or Volume ID is invalid, or `kFPMiscErr` if an error occurred that is not specific to AFP.

ReplyBlock

None.

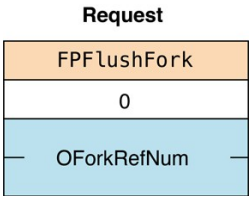
Discussion

This command writes to disk any data buffered by the server by previous write commands. If the fork has been modified, the server set's the file's modification date to the server's clock.

In order to optimize disk access, the server may buffer write commands made to a particular file fork. Within the constraints of performance, the server flushes each fork as soon as possible. By sending this command, the AFP client can force the server to write any buffered data.

Figure 34 shows the request block for the `FPFlushFork` command.

Figure 34 Request block for the `FPFlushFork` command



FPGetACL

Gets the access control list for a file or directory.

```
uint8_t CommandCode
uint8_t Pad
int16_t VolumeID
int32_t DirectoryID
uint16_t Bitmap
int32_t MaxReplySize
uint8_t Pathtype
string Pathname
```

Parameters

CommandCode

`kFPGetACL` (73).

Pad

Pad byte.

VolumeID

Volume identifier.

DirectoryID

Directory identifier.

Bitmap

Bits that specify the values that are to be obtained. Specify `kFileSec_UUID` to get the UUID of the specified file or directory. Specify `kFileSec_GRPUUID` to get the Group UUID of the specified file or directory. Specify `kFileSec_ACL` to get the ACL of the specified file or directory. For declarations of these constants, see “Access Control List Bitmap.”

MaxReplySize

Reserved. Set this parameter to zero.

PathType

Type of names in `Pathname`. See “Path Type Constants” for possible values.

Pathname

Pathname of the file or directory for which the access control list (ACL) is to be obtained. `Pathname` is a string if it contains Short or Long Names or an AFPName if it contains a UTF-8–encoded path. See the Character Encoding section of “Apple Filing Protocol Concepts” in *Apple Filing Protocol Programming Guide* for additional details about the UTF-8 encoding used by AFP.

Result

`kFPNoErr` if no error occurred. See Table 25 for other possible result codes.

ReplyBlock

If the result code is `kFPNoErr`, the server returns a reply block. See Table 27 for the format of the reply block.

Discussion

Depending on the bits set in the `Bitmap` parameter, this command gets the UUID, Group UUID, or ACL for the specified file or directory. If the `kFileSec_UUID` bit is set, the file or directory’s UUID appears first in the reply packet. If the `kFileSec_GRPUUID` bit is set, the file or directory’s Group UUID appears next in the reply packet. If the `kFileSec_ACL`

bit is set, the file or directory's ACL appears next in the packet.

Support for this command, as well as `FPAccess` and `FPSetACL` is required in order to support access control lists (ACLs). Support for UTF-8 and UUIDs is also required in order to support ACLs. See the Character Encoding section of "Apple Filing Protocol Concepts" in *Apple Filing Protocol Programming Guide* for additional details about the UTF-8 encoding used by AFP.

Table 25 lists the result codes for the `FPGetACL` command.

Table 25 Result codes for the `FPGetACL` command

Result code	Explanation
`kFPAccessDenied`	User does not have the access rights required to get the ACL for the specified file or directory.
`kFPMiscErr`	Non-AFP error occurred.
`kFPObjectNotFound`	Input parameters do not point to an existing file or directory.
`kFPParamErr`	A parameter is invalid.

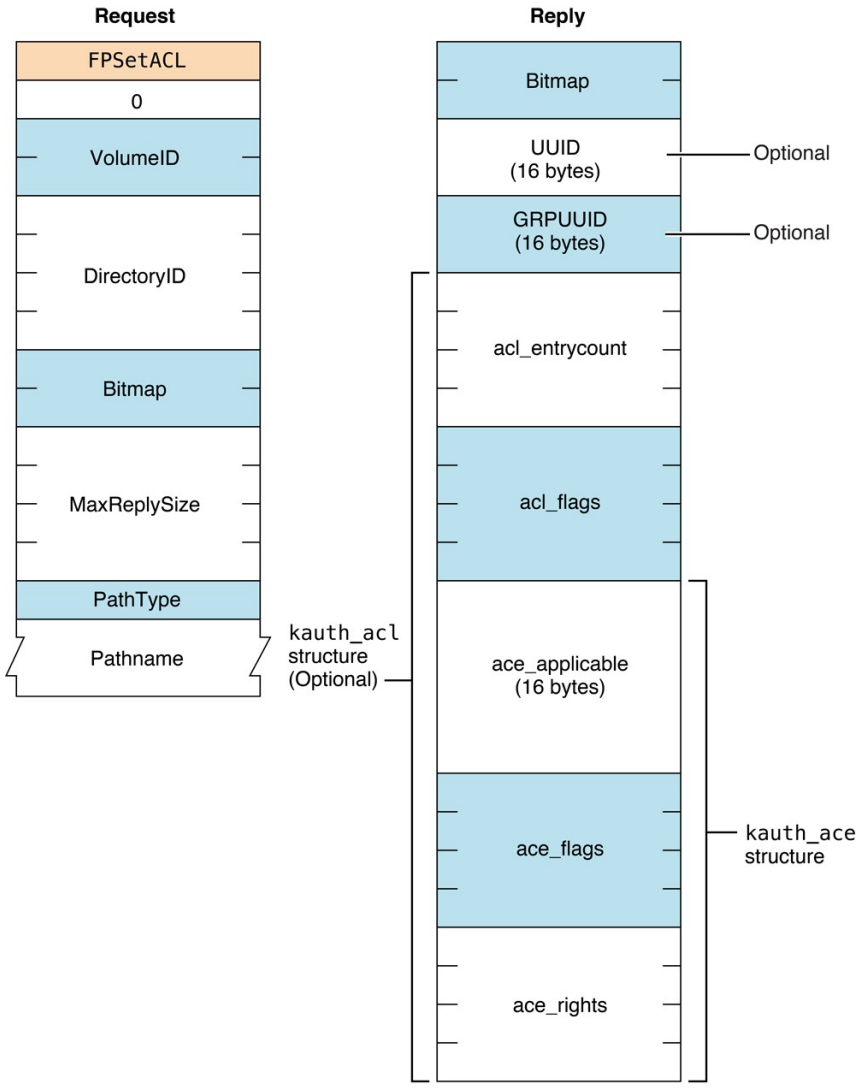
Table 26 describes the reply block for the `FPGetACL` command.

Table 26 Reply block for the `FPGetACL` command

Name and size	Data
`Bitmap` (`int16_t`)	Copy of the bitmap sent to the server.
`UUID` (16 bytes)	File or directory's UUID, if the `kFileSec_UUID` bit was set.
`GRPUUID` (16 bytes)	File or directory's Group UUID, if the `kFileSec_GRPUUID` bit was set.
`ACL`	File or directory's ACL in a `kauth_acl` structure, if the `kFileSec_ACL` bit was set. For details, see `Access Control List Structure`.

Figure 35 shows the request and reply blocks for the `FPGetACL` command.

Figure 35 Request and reply blocks for the `FPGetACL` command



Version Notes

Introduced in AFP 3.2.

FPGetAPPL

Retrieves an APPL mapping from a volume's Desktop database.

```
uint8_t CommandCode
uint8_t Pad
int16_t DTRefNum
int32_t FileCreator
int16_t APPLIndex
```

Parameters

CommandCode

`kFPGetAPPL` (55).

Pad

Pad byte.

DTRefNum

Desktop database reference number.

FileCreator

File creator of the application corresponding to the APPL mapping to be retrieved.

APPLIndex

Index of the APPL mapping to be retrieved.

Result

`kFPNoErr` if no error occurred, `kFPParamErr` if the session reference number or Desktop database reference is unknown, `kFPItemNotFound` if no entries in the Desktop database match the input parameters, `kFPBitmapErr` if an attempt was made to retrieve a parameter that cannot be obtained with this command, or `kFPMiscErr` if an error occurred that is not specific to AFP.

ReplyBlock

If the result code is `kFPNoErr`, the server returns a reply block. See Table 27 for the format of the reply block.

Discussion

For each file creator, the Desktop database contains a list of APPL mappings. Each APPL mapping contains the Parent Directory ID and CNode name of an application associated with the file creator, as well as an APPL Tag that can be used to distinguish among the APPL mappings (the APPL Tag is uninterpreted by the Desktop database).

Information about the application file associated with each APPL mapping can be obtained by sending successive `FPGetAPPL` commands with `Index` varying from one to the total number of APPL mappings stored in the Desktop database for that file creator. If `Index` is more than the number of APPL mappings in the Desktop database for `FileCreator`, a `kFPItemNotFound` result code is returned. An `Index` of zero returns the first APPL mapping, if one exists in the Desktop database.

The server retrieves the specified parameters for the application file and packs the, in bitmap order, in the reply block.

The user must have search access to all ancestors except the parent directory and read access to the parent directory of the application for which information will be returned.

The user must have previously called `FPOpenDT` for the corresponding volume.

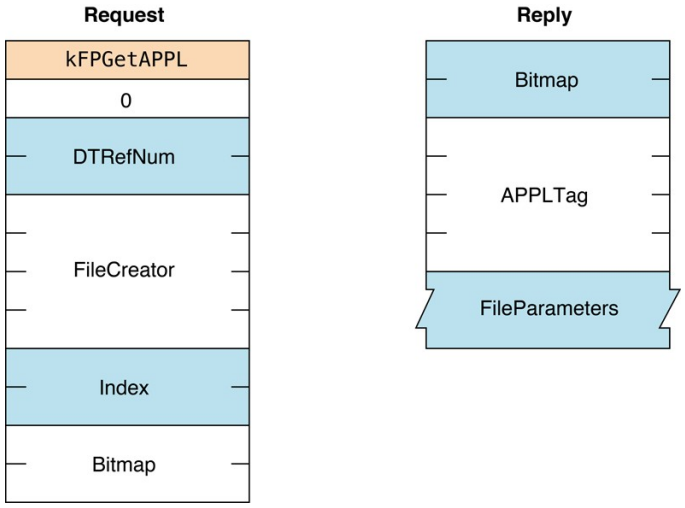
Table 27 describes the reply block for the `FPGetAPPL` command.

Table 27 Reply block for the `FPGetAPPL` command

Name and size	Data
`Bitmap` (`int16_t`)	Bitmap describing the parameters of the application file to return. Set the bit that corresponds to each desired parameter. This bitmap is the same as the `FileBitmap` parameter of the `FPGetFileDirParms` command. For bit definitions for the File bitmap, see Table 1-7 in “File and Directory Bitmap.”
`APPLTag` (`int32_t`)	Tag information associated with the APPL mapping.
`FileParameters`	Requested file parameters.

Figure 36 shows the request and reply blocks for the `FPGetAPPL` command.

Figure 36 Request and reply blocks for the `FPGetAPPL` command



Availability

Deprecated in OS X v.10.6.

FPGetAuthMethods

Gets the UAMs that an Open Directory domain supports.

```
uint8_t CommandCode
uint8_t Pad
uint8_t Flags
uint8_t PathType
string Pathname
```

Parameters

CommandCode

`kFPGetAuthMethods` (62).

Pad

Pad byte.

Flags

Flags providing additional information. (No flags are currently defined.)

PathType

Type of names in `Pathname`. See “Path Type Constants” for possible values.

Pathname

Pathname of the Open Directory domain for which UAMs are to be obtained. `Pathname` is a string if it contains Short or Long Names or an AFPName if it contains a UTF-8-encoded path. See the Character Encoding section of “Apple Filing Protocol Concepts” in *Apple Filing Protocol Programming Guide* for additional details about the UTF-8 encoding used by AFP.

Result

`kFPNoErr` if no error occurred, `kFPObjectNotFound` if the specified Open Directory domain could not be found, or `kFPMiscErr` if an error occurred that is not specific to AFP.

ReplyBlock

If the result code is `kFPNoErr`, the server returns a reply block. See Table 28 for the format of the reply block.

Discussion

This command gets the UAMs for the specified Open Directory domain.

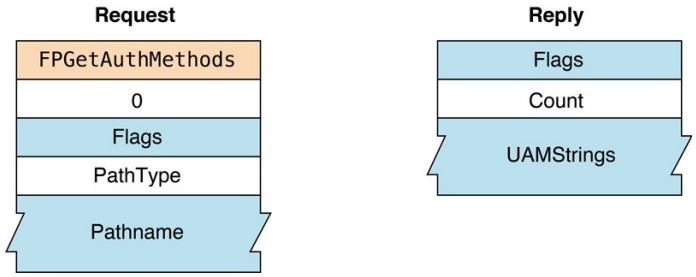
Table 28 describes the reply block for the `FPGetAuthMethods` command.

Table 28 Reply block for the `FPGetAuthMethods` command

`Flags` (`uint8_t`)	Copy of the Flags input parameter.
`Count` (`uint8_t`)	Number of UAMs that follow.
`UAMStrings` (packed Pascal strings)	Packed Pascal strings containing the names of the available UAMs

Figure 37 shows the request and reply blocks for the `FPGetAuthMethods` command.

Figure 37 Request and reply blocks for the `FPGetAuthMethods` command



Availability

Deprecated.

FPGetComment

Gets the comment associated with a file or directory from the volume's Desktop database.

```
uint8_t CommandCode
uint8_t Pad
int16_t DTRefNum
int32_t DirectoryID
uint8_t PathType
string Pathname
```

Parameters

CommandCode

`kFPGetComment` (58).

Pad

Pad byte.

DTRefNum

Desktop database reference number.

DirectoryID

Directory ID.

PathType

Type of names in `Pathname`. See "Path Type Constants" for possible values.

Pathname

Pathname to desired file or directory. `Pathname` is a string if it contains Short or Long Names or an AFPName if it contains a UTF-8-encoded path. See the Character Encoding section of "Apple Filing Protocol Concepts" in *Apple Filing Protocol Programming Guide* for additional details about the UTF-8 encoding used by AFP.

Result

`kFPNoErr` if no error occurred. See Table 29 for other possible result codes.

ReplyBlock

If the result code is `kFPNoErr`, the server returns a reply block. The reply block consists of a string, called `Comment`, containing the comment text.

Discussion

The comment for the specified file or directory, if it is found in the volume's Desktop database, is returned in the reply block.

If the comment is associated with a directory, the user must have search access to all ancestors, including the parent directory. If the comment is associated with a file, the user must have search access to all ancestors except the parent directory and read access to the parent directory.

The user must have previously called `FPOpenDT` for the corresponding volume. In addition, the file or directory must exist before this command is sent.

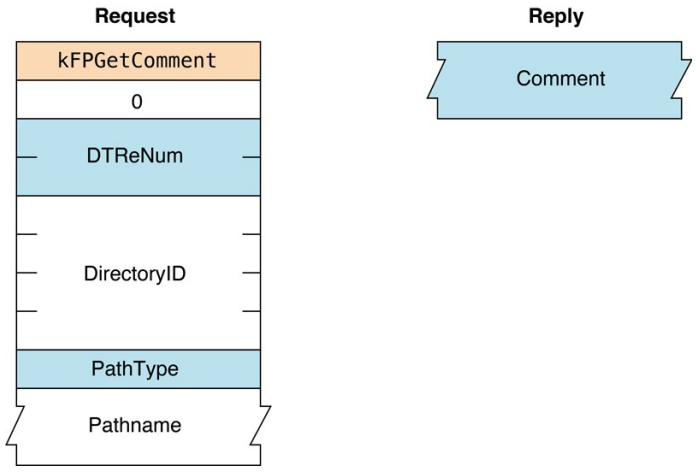
Table 29 lists the result codes for the `FPGetComment` command.

Table 29 Result codes for the `FPGetComment` command

Result code	Explanation
`kFPAccessDenied`	User does not have the access privileges required to use this command.
`kFPItemNotFound`	No comment was found in the Desktop database.
`kFPParamErr`	Session reference number or Desktop database reference number is unknown.
`kFPObjectNotFound`	Input parameters do point to an existing file or directory.
`kFPMiscErr`	Non-AFP error occurred.

Figure 38 shows the request and reply blocks for the `FPGetComment` command.

Figure 38 Request and reply blocks for the `FPGetComment` command



Availability

Deprecated in OS X v.10.6.

FPGetExtAttr

Gets the value of an extended attribute.

```
uint8_t CommandCode
uint8_t Pad
int16_t VolumeID
int32_t DirectoryID
uint16_t Bitmap
int64_t Offset
int64_t ReqCount
int32_t MaxReplySize
uint8_t PathType
string Pathname
uint8_t Pad
uint16_t NameLength
string Name
```

Parameters

CommandCode

`kFPGetExtAttr` (69).

Pad

Pad byte.

VolumeID

Volume identifier.

DirectoryID

Directory identifier.

Bitmap

Bitmap specifying the desired behavior when getting the value of an extended attribute. For this command, only `kAttrDontFollow` is valid. For details, see "`Extended Attributes Bitmap`" for details.

Offset

Always zero; reserved for future use.

ReqCount

Always -1; reserved for future use.

MaxReplySize

Size in bytes of the reply that your application can handle; set to zero to get the size of the reply without actually getting the attributes.

PathType

Type of names in `Pathname`. See "Path Type Constants" for possible values.

Pathname

Pathname to desired file or directory. `Pathname` is a string if it contains Short or Long Names or an AFPName if it contains a UTF-8–encoded path.

Pad

Optional pad byte if needed to pad to an even boundary.

NameLength

Length in bytes of the extended attribute name that follows.

Name

UTF-8–encoded name of the extended attribute whose value is to be obtained.

Result

`kFPNoErr` if no error occurred. See Table 30 for other possible result codes.

ReplyBlock

If the result code is `kFPNoErr`, the server returns a reply block. The reply block consists of a bitmap and the value of the extended attribute that was requested. See Table 31 for the format of the reply block.

Discussion

If the result code is `kFPNoErr`, this command returns in the reply block the value of the extended attribute that was

requested.

If the extended attribute is too large to fit in the client's buffer (as specified by the `MaxReplySize` parameter), the server should fill in the `Bitmap` field, set the `DataLength` field to the actual size of the extended attribute, and return `kFPParamErr`.

Note: The maximum attribute length that the `FPGetExtAttr` and `FPSetExtAttr` commands can handle is the lesser of the server's quantum size (see `DSIOpenSession` and "AFP Over TCP") and the maximum extended attribute length that the backing filesystem can handle.

For example, if the AFP Server is sharing part of an HFS+ volume, the maximum length of the extended attribute is either the AFP server quantum size or the HFS+ maximum extended attribute length, whichever is smaller.

The server should return `kFPMiscErr` if the extended attribute requested does not exist on this file.

Support for this command, as well as `FPListExtAttrs`, `FPRemoveExtAttr` and `FPSetExtAttr` is required in order to support extended attributes. UTF-8 support is also required in order to support extended attributes.

See the Character Encoding section of "Apple Filing Protocol Concepts" in *Apple Filing Protocol Programming Guide* for additional details about the UTF-8 encoding used by AFP.

Table 30 lists the possible result codes for the `FPGetExtAttr` command.

Table 30 Result codes for the `FPGetExtAttr` command

Result code	Explanation
`kFPAccessDenied`	User does not have the access privileges required to get the file of an extended attribute for the specified file or directory.
`kFPBitmapErr`	Bitmap is null or specifies a value that is invalid for this command.
`kFPMiscErr`	Non-AFP error occurred. For example, the server should return `kFPMiscErr` if the extended attribute requested does not exist on this file.
`kFPObjectNotFound`	Input parameters do not point to an existing file or directory.
`kFPParamErr`	A parameter is invalid.

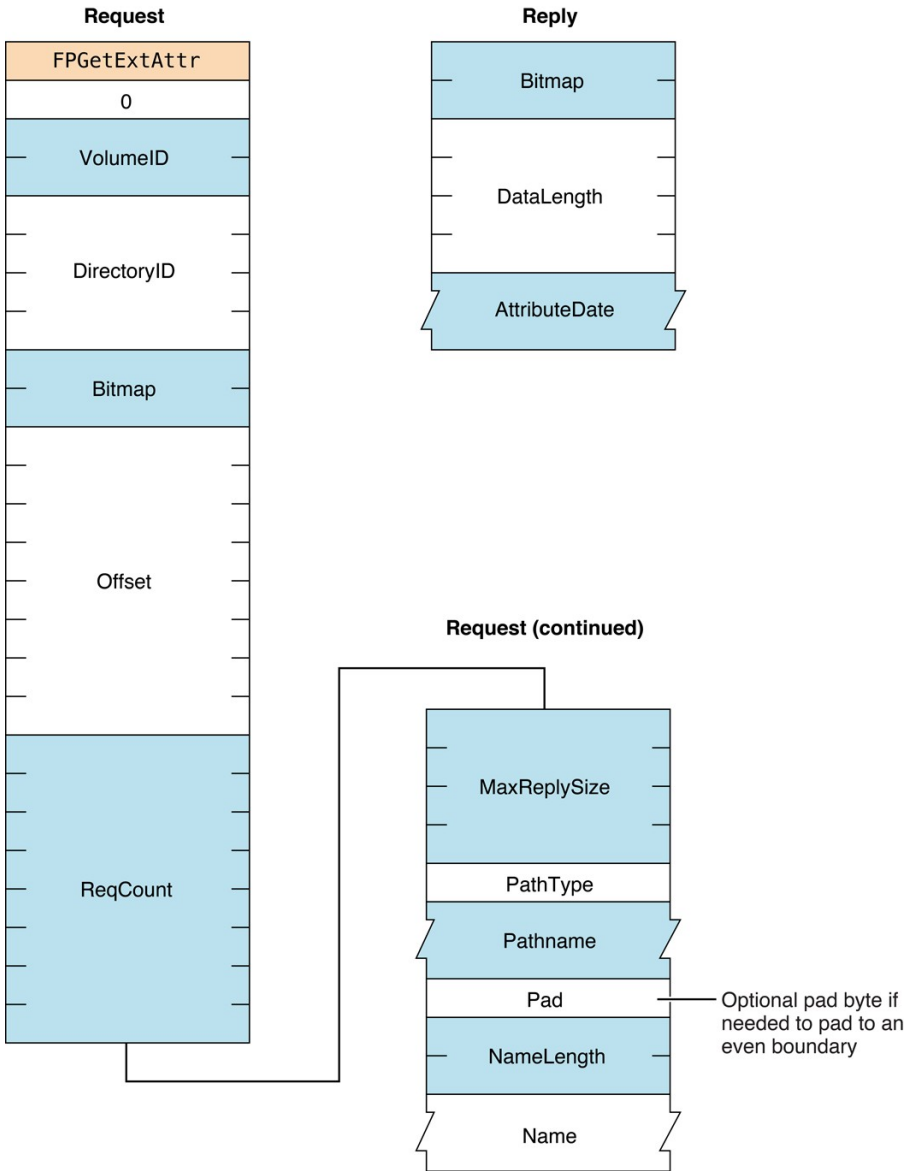
Table 31 describes the reply block for the `FPGetExtAttr` command.

Table 31 Reply block for the `FPGetExtAttr` command

Name and size	Data
`Bitmap` (`int16_t`)	Copy of the input parameter.
`DataLength` (`int32_t`)	Length in bytes of the extended attribute data that follows.
`ExtendedAttribute Data` (`string`)	Extended attribute data

Figure 38 shows the request and reply blocks for the `FPGetExtAttr` command.

Figure 39 Request and reply blocks for the `FPGetExtAttr` command



Version Notes

Introduced in AFP 3.2.

FPGetFileDirParms

Gets the parameters for a file or a directory.

```
uint8_t CommandCode
uint8_t Pad
int16_t VolumeID
int32_t DirectoryID
int16_t FileBitmap
int16_t DirectoryBitmap
uint8_t PathType
string Pathname
```

Parameters

CommandCode

`kFPGetFileDirParms` (34).

Pad

Pad byte.

VolumeID
Volume ID.

DirectoryID
Directory ID.

FileBitmap
Bitmap describing the parameters to return for a file. Set the bit that corresponds to each desired parameter. For the bit definitions of this bitmap, see "File and Directory Bitmap."

DirectoryBitmap
Bitmap describing the parameters to return for a directory. Set the bit that corresponds to each desired parameter. For the bit definitions of this bitmap, see "File and Directory Bitmap."

PathType
Type of names in `Pathname`. See "Path Type Constants" for possible values.

Pathname
Pathname to desired file or directory. `Pathname` is a string if it contains Short or Long Names or an AFPName if it contains a UTF-8–encoded path. See the Character Encoding section of "Apple Filing Protocol Concepts" in *Apple Filing Protocol Programming Guide* for additional details about the UTF-8 encoding used by AFP.

Result
`kFPNoErr` if no error occurred. See Table 32 for other possible result codes.

ReplyBlock
If the result code is `kFPNoErr`, the server returns a reply block. See Table 33 for the format of the reply block.

Discussion

The server packs the requested parameters in the reply block in the order specified by the appropriate bitmap. The `FileDir` bit indicates whether the parameters are for a file or a directory. A copy of the input bitmaps is inserted before the parameters.

Variable-length parameters, such as Long Name and Short Name, are kept at the end of the block. To do this, the server represents variable-length parameters in the bitmap order as fixed-length offsets (integers). Each offset is measured from the start of the parameters (not from the start of the bitmap) to the start of the variable-length parameter. The actual variable-length parameters are then packed after all fixed-length parameters.

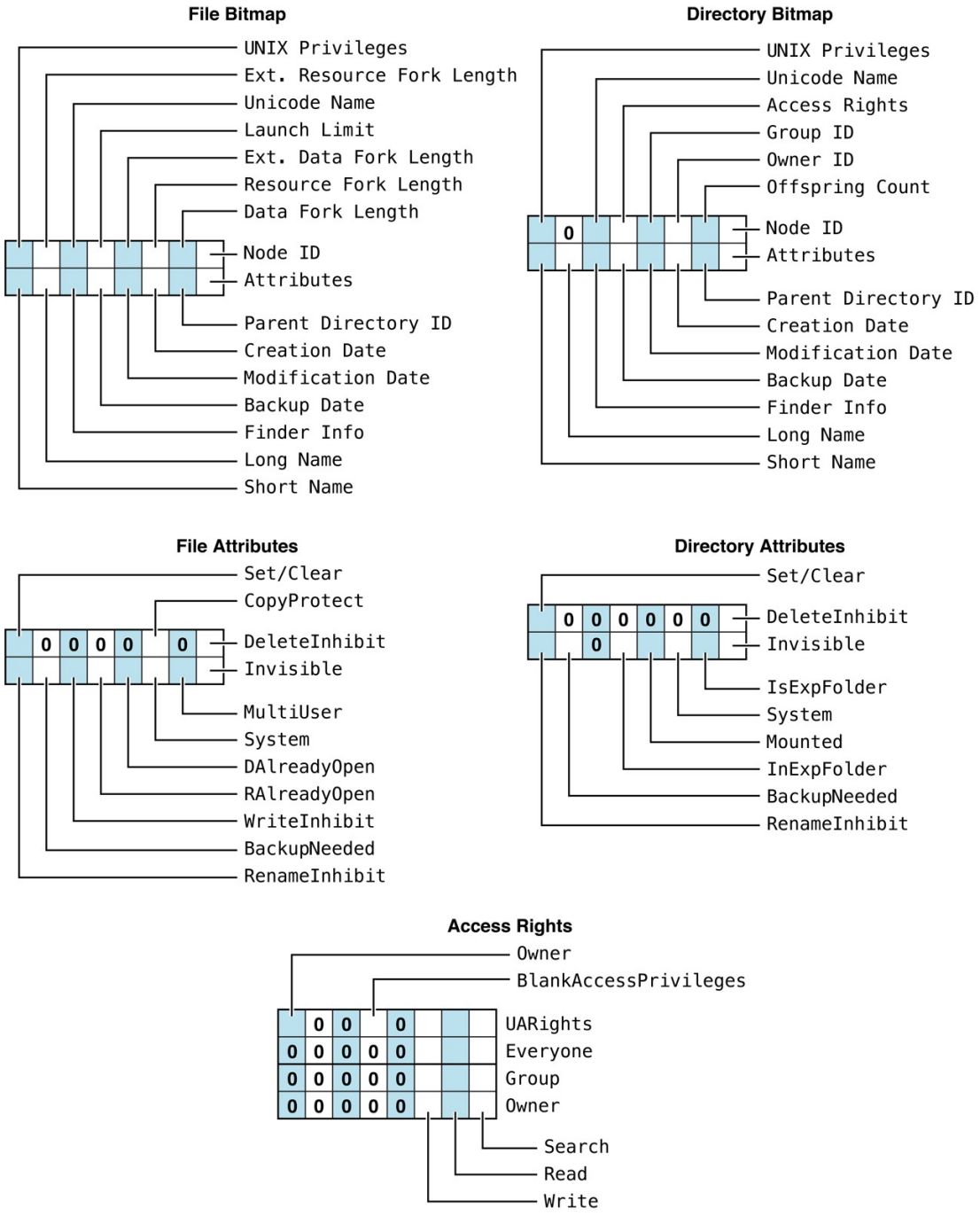
If the CNode exists and both bitmaps are null, no error is returned; `FileBitmap`, `DirectoryBitmap`, and the byte containing the `FileDir` bit are returned with no other parameters.

If a directory's access rights are requested, the server returns the Access Rights parameter (a four-byte quantity) containing the read, write, and search access privileges corresponding to owner, group, and everyone as well as the User Access Rights Summary byte, which indicates the privileges the current user of the AFP client has to this directory. For bit definitions of the Access Rights parameter, see "Access Rights Bitmap."

If the Offspring Count bit of the `DirectoryBitmap` parameter is set, the server will adjust the Offspring Count to reflect the access rights the user has to that directory. For example, if a particular directory contains three file and two directory offspring, the server will return its Offspring Count as two if the user has only search access to the directory, three if the user has only read access to the directory, or five if the user has both search and read access to the directory.

Figure 40 shows the file and directory bitmaps, the File and Directory Attributes parameters, and the Access Rights for directories.

Figure 40 Bitmaps, Attributes, and Access Rights returned by `FPGetFileDirParms`



The user must have search access to all ancestors except this CNode's parent directory. For directories, the user also needs search access to the parent directory. For files, the user needs read access to the parent directory.

Most of the attributes requested by this command are stored in corresponding flags within the CNode's Finder Info record.

Table 32 lists the result codes for the `FPGetFileDirParms` command.

Table 32 Result codes for the `FPGetFileDirParms` command

Result code	Explanation
`kFPAccessDenied`	User does not have the access privileges required to use this command.
`kFPBitmapErr`	Attempt was made to retrieve a parameter that cannot be obtained with this command.

kFPMiscErr	Non-AFP error occurred.
kFPObjectNotFound	Input parameters do not point to an existing file or directory.
kFPParamErr	Session reference number, Volume ID, or pathname type is unknown; pathname is invalid.

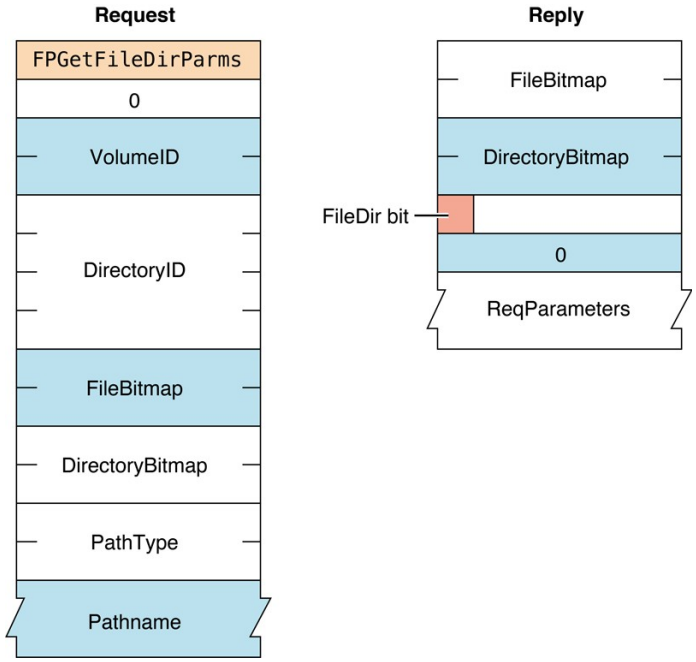
Table 33 describes the reply block for the FPGetFileDirParms command.

Table 33 Reply block for the FPGetFileDirParms command

Name and size	Data
FileBitmap (int16_t)	Copy of the input parameter.
DirectoryBitmap (int16_t)	Copy of the input parameter.
FileDir (bit)	Bit indicating whether the CNode is a file or a directory:0 = file 1 = directory
ReqParameters	Requested parameters.

Figure 41 shows the request and reply blocks for the FPGetFileDirParms command.

Figure 41 Request and reply blocks for the FPGetFileDirParms command



FPGetForkParms

Gets the parameters for a fork.

```
uint8_t CommandCode
uint8_t Pad
int16_t OForkRefNum
```

```
int16_t Bitmap
```

Parameters

CommandCode

`kFPGetForkParms` (14).

Pad

Pad byte.

OForkRefNum

Open fork reference number.

Bitmap

Bitmap describing the parameters to be returned. Set the bits that correspond to each desired parameter. This bitmap is the same as the `FileBitmap` parameter of the `FPGetFileDirParms` command. For bit definitions for this bitmap, see "File and Directory Bitmap."

Result

`kFPNoErr` if no error occurred, `kFPParamErr` if the session reference number or open fork reference number is invalid, `kFPBitmapErr` if an attempt was made to retrieve a parameter that cannot be obtained with this command; bitmap is null, or `kFPMiscErr` if an error occurred that is not specific to AFP.

ReplyBlock

If the result code is `kFPNoErr`, the server returns a reply block. See Table 34 for the format of the reply block.

Discussion

The server packs the parameters in bitmap order in the reply block.

Variable-length parameters, such as Long Name and Short Name, are kept at the end of the block. To do this, the server represents variable-length parameters in the bitmap order as fixed-length offsets (integers). Each offset is measured from the start of the parameters (not from the start of the bitmap) to the start of the variable-length parameter. The actual variable-length fields are then packed after all fixed-length parameters.

This command retrieves the length the fork indicated by `OForkRefNum`; a `kFPBitmapErr` result code is returned if an attempt is made to retrieve the length of the file's other fork.

The user must have previously called `FPOpenFork` for this volume.

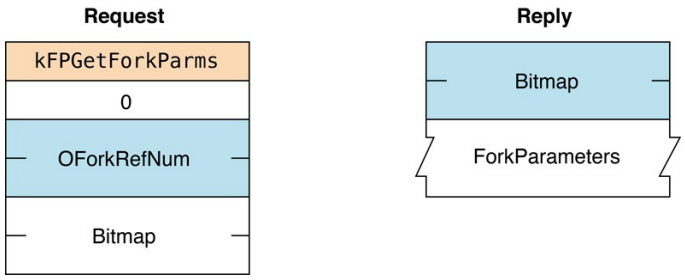
Table 34 describes the reply block for the `FPGetForkParms` command.

Table 34 Reply block for the `FPGetForkParms` command

Name and size	Data
`Bitmap` (`int16_t`)	Copy of the input parameter.
`FileParameters`	Requested fork parameters.

Figure 42 shows the request and reply blocks for the `FPGetForkParms` command.

Figure 42 Request and reply blocks for the `FPGetForkParms` command



FPGetIcon

Gets an icon from the Desktop database.

```
uint8_t CommandCode
uint8_t Pad
int16_t DTRefNum
int32_t FileCreator
int32_t FileType
uint8_t IconType
uint8_t Pad
int16_t Length
```

Parameters

CommandCode

`kFPGetIcon` (51).

Pad

Pad byte.

DTRefNum

Desktop database reference number.

FileCreator

File creator of the file with which the icon is associated.

FileType

File type of the file with which the icon is associated.

IconType

Preferred icon type.

Pad

Pad byte.

Length

Number of bytes the caller expects the icon bitmap to require in the reply block.

Result

`kFPNoErr` if no error occurred, `kFPParamErr` if the session reference number or Desktop database reference number is unknown, `kFPItemNotFound` if no icon corresponding to the input parameters was found in the Desktop database, or `kFPMiscErr` if an error occurred that is not specific to AFP.

ReplyBlock

If the result code is `kFPNoErr`, the server returns a reply block. The reply block consists of a int16_t containing the requested icon bitmap.

Discussion

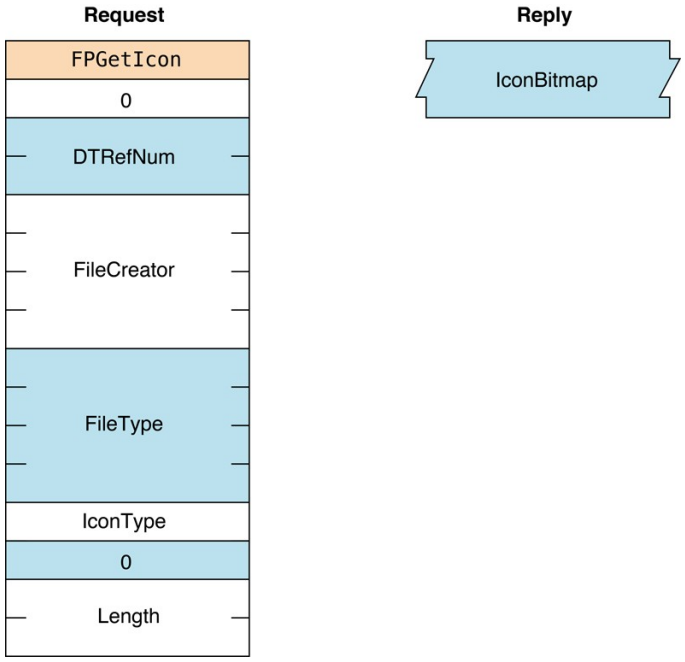
The server retrieves an icon bitmap from the Desktop database as specified by the `FileCreator`, `FileType`, and `IconType` parameters.

An input `Length` value of zero is acceptable to test for the presence or absence of a particular icon. If `Length` is less than the actual size of the icon bitmap, only `Length` bytes are returned.

The user must have previously called `FPOpenDT` for the corresponding volume.

Figure 43 shows the request and reply blocks for the `FPGetIcon` command.

Figure 43 Request and reply blocks for the `FPGetIcon` command



Availability

Deprecated in OS X v.10.6.

FPGetIconInfo

Gets icon information from the Desktop database.

```
uint8_t CommandCode
uint8_t Pad
int16_t DTRefNum
int32_t FileCreator
int16_t IconIndex
```

Parameters

CommandCode

`kFPGetIconInfo` (51).

Pad

Pad byte.

DTRefNum

Desktop database reference number.

FileCreator

File creator of the file with which the icon is associated.

IconIndex

Index of the requested icon.

Result

`kFPNoErr` if no error occurred, `kFPParamErr` if the session reference number or Desktop database reference number is unknown, `kFPItemNotFound` if no icon corresponding to the input parameters was found in the Desktop database, or `kFPMiscErr` if an error occurred that is not specific to AFP.

ReplyBlock

If the result code is `kFPNoErr`, the server returns a reply block. See Table 35 for the format of the reply block.

Discussion

The server retrieves a information about an icon in the volume's Desktop database as specified by the icon's file creator and icon index.

For each file creator, the Desktop database contains a list of icons. Information about each icon can be obtained by sending successive `FPGetIconInfo` commands with `IconIndex` varying from one to the total number of icons stored in the Desktop database for that file creator. If `IconIndex` is more than the number of icons in the Desktop database for the specified file creator, a result code of `kFPItemNotFound` is returned.

The user must have previously called `FPOpenDT`FPOpenDT for the corresponding volume.

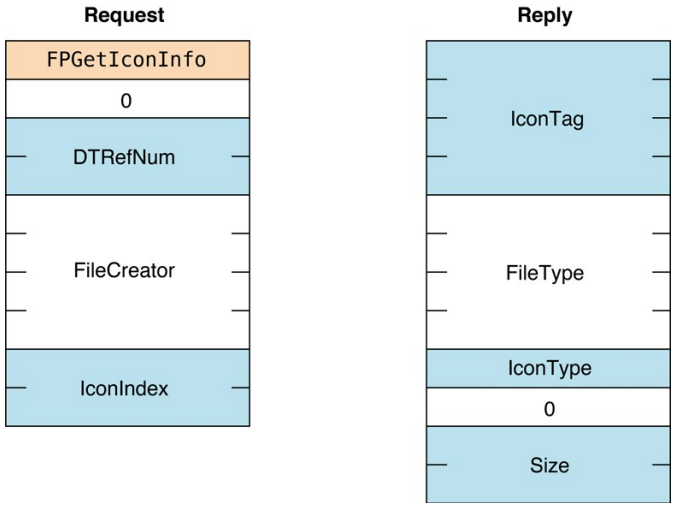
Table 35 describes the reply block for the `FPGetIconInfo` command.

Table 35 Reply block for the `FPGetIconInfo` command

Name and size	Data
`IconTag` (`int32_t`)	Tag information associated with the requested icon.
`FileType` (`int32_t`)	File type of the requested icon.
`IconType` (`uint8_t`)	Type of the requested icon.
`Pad` (`uint8_t`)	Pad byte.
`Size` (`int16_t`)	Size of the icon bitmap.

Figure 44 shows the request and reply blocks for the `FPGetIconInfo` command.

Figure 44 Request and reply blocks for the `FPGetIconInfo` command



Availability

Deprecated in OS X v.10.6.

FPGetSessionToken

Gets a session token.

```
uint8_t CommandCode
uint8_t Pad
int16_t Type
int32_t IDLength
int32_t timeStamp (optional)
ID
```

Parameters

CommandCode

`kFPGetSessionToken` (64).

Pad

Pad byte.

Type

The value of this parameter is `kLoginWithoutID` (0) if the client supports an earlier version of AFP that does not send an `IDLength` and an `ID` parameter.

It is `kLoginWithTimeAndID` (3) if the client is sending an `IDLength`, an `ID`, and a `Timestamp` parameter and the client wants its old session to be discarded.

It is `kReconnWithTimeAndID` (4) if the client has just finished a successful reconnect, is sending an `IDLength`, an `ID`, and a `Timestamp` parameter, and wants the session to be updated with the `ID` parameter.

It is `kRecon1Login` (5) if the client is using the Recon1 UAM to login.

It is `kRecon1ReconnectLogin` (6) if the client just finished a successful reconnect and it is using the Recon1 UAM.

It is `kRecon1RefreshToken` (7) if the client is using the Recon1 UAM and needs to refresh the token.

It is `kGetKerberosSessionKey` (8) if the client is logging in using Kerberos v5.

See “FPGetSessionToken Types” for the enumeration that defines the constants for this parameter.

IDLength

Length of the `ID` parameter.

timeStamp

Optional time stamp specified only if the value of `ID` is `kLoginWithTimeAndID` or `kReconnWithTimeAndID`.

ID

A client-defined value that uniquely identifies this session.

Result

`kFPNoErr` if no error occurred, `kFPParamErr` if the session reference number is unknown, `kFPCallNotSupported` if the server does not support this command, or `kFPMiscErr` if an error occurred that is not specific to AFP.

ReplyBlock

If the result code is `kFPNoErr`, the server returns a reply block. See Table 36 for the format of the reply block.

Discussion

This command helps an AFP client manage a disconnect that occurs and there are open files or locked resources on the remote server. The remote server will save the current state of the session (including open files) and wait until its reconnect timeout expires before closing the files and discarding the saved session. In the case of an AFP client that fails to wake up properly from sleep with a mounted AFP server, the session will be saved on the remote server until the sleep timeout expires.

Under these circumstances, prior to AFP 3.1, when an AFP client logged back into the server from the same system, attempts to access the files that were open at the time of the crash would fail with a “file already open” or “resources already locked” result. The AFP client would have to wait for the reconnect or sleep timeout to expire, or a server administrator would have to manually disconnect the old session.

With AFP 3.1 and later, the AFP client can set the `Type` parameter to `kLoginWithID`, set the `ID` parameter to a unique client-defined value, and send this command. The server will associate the value of `ID` with the session. Later, if the local system crashes and the AFP client logs in again, the AFP client can set the `Type` parameter to `kLoginWithID`, set the `ID` parameter to the ID that it previously sent to the remote server, and send this command again. The remote

server will look for a session that matches the value of ID. If a match is found, it will close any files associated with the session that are open, free any locked resources, and disconnect the matching session. Note that in the current version, the unique ID is associated with a particular computer, so after the system crashes, the AFP client must log in from the same computer using the same information that was used to log in originally.

With AFP 3.1 and later, the AFP client can also set the `Type` parameter to `kLoginWithTimeAndID`. In this case, the client must include a four-byte time stamp after the `IDLength` field, and the server saves the time stamp as well as the value of `ID` for each session. When the server receives a `FPGetSessionToken` command having a `TYPE` parameter whose value is `kLoginWithTimeAndID`, the server searches all of its session queues. If the server finds a session that matches the value of `ID`, it also checks the time stamp. If the time stamp matches, the client has *not* restarted so the session is not discarded. The session is only discarded if the saved time stamp does not match.

This command returns a session token that, with AFP 3.0 and later, is used to reconnect. If the local system is disconnected and the AFP client logs in again using the same log in information as before, the AFP client can call `FPDisconnectOldSession`, passing the session token obtained by calling `FPGetSessionToken`, to tell the server to transfer the old session to the new session.

Note that sending the `FPGetSrvrMsg` command does not initiate a reconnect.

For security purposes, the server always fails reconnections for users who log in as Guest.

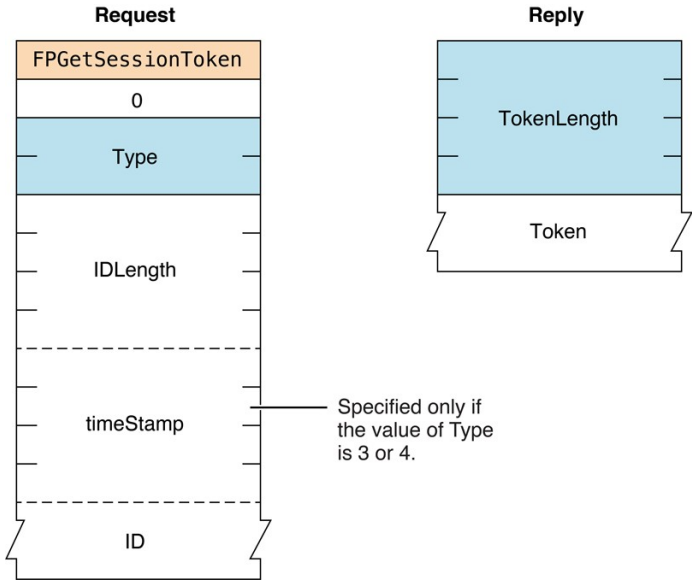
Table 36 describes the reply block for the `FPGetSessionToken` command.

Table 36 Reply block for the `FPGetSessionToken` command

Name and size	Data
`TokenLength` (`int32_t`)	Length of the token that follows.
`Token` (variable length)	Token that can be passed to `FPDisconnectOldSession` if the session is inadvertently disconnected and then re-established. If the client supports the Reconnect UAM, the token needs to be refreshed periodically, and is also sent to the server by the `FPLoginExt` command to reconnect if the session is disconnected.

Figure 45 shows the request and reply blocks for the `FPGetSessionToken` command.

Figure 45 Request and reply blocks for the `FPGetSessionToken` command



FPGetSrvrInfo

Gets information about a server.

```
uint8_t CommandCode
uint8_t Pad
```

Parameters

CommandCode

`kFPGetSrvrInfo` (15).

Pad

Pad byte.

Result

`kFPNoErr` if no error occurred, `kFPNoServer` if the server is not responding, or `kFPMiscErr` if an error occurred that is not specific to AFP.

ReplyBlock

If the result code is `kFPNoErr`, the server returns a reply block. See Table 38 for the format of the reply block.

Discussion

The reply block begins with the offset to the `MachineType` parameter, followed by the offset to the `AFPVersions` parameter, the offset to the `UAMs` parameter, and the offset to the `VolumeIconAndMask` parameter. The offsets are followed by the `Flags` parameter, the `ServerName` parameter padded to an even boundary, the offset to the `ServerSignature` parameter, and the offset to the `NetworkAddresses` parameter.

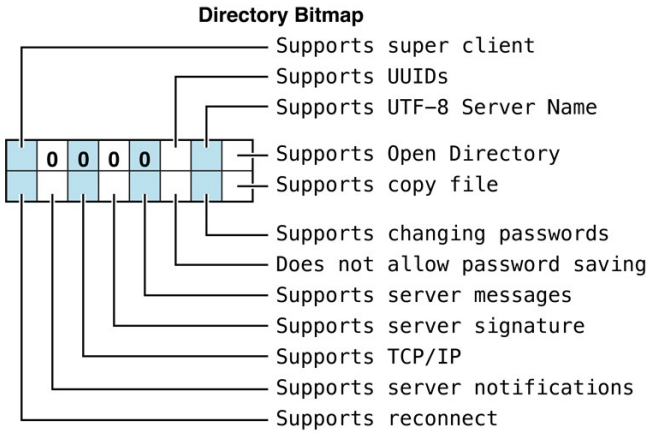
The server packs the information in the reply block in any order, so no assumption should be made about the order of the information. Instead AFP clients should access the information only through the offsets. The exception is the `ServerName` parameter, which is always after the `Flags` parameter.

Providing offsets to the `VolumeIconAndMask`, `ServerSignature`, `NetworkAddresses`, and `DirectoryNames` parameters is required, but providing the parameters themselves is optional. If not provided, the value of each parameter is zero.

The `Flags` parameter indicates the server's support for certain features. If bit 9 in the `Flags` parameter is set, the reply block contains a `UTF8ServerNames` offset to the server's name in UTF-8 format. (See the Character Encoding section of "Apple Filing Protocol Concepts" in *Apple Filing Protocol Programming Guide* for additional details about the UTF-8 encoding used by AFP.)

Figure 46 shows how bits are used in the `Flags` parameter.

Figure 46 Bit usage in the ServerFlags parameter



The `AFPVersionsCount` and `UAMCount` parameters are each one byte containing the number of AFP and UAM version strings that follow, with the strings packed back-to-back without padding. For the AFP versions supported by this

version of AFP, see "AFP Version Strings". For the UAMs supported by this version of AFP, see "AFP UAM Strings".

The optional ServerSignature parameter contains a unique identifier for the server. An AFP client should use the server signature to ensure that it does not log on to the same server multiple times. Preventing multiple log ins is important when the server is configured for multihoming.

The NetworkAddresses parameter contains the addresses that the client can use to connect to the server. Each address is stored as an AFP Network Address. The format of an AFP Network Address is shown in Figure 47.

Figure 47 AFP Network Address format

Each AFP Network Address consists of a length byte containing the total length in bytes of the Network Address, followed by a tag byte identifying the type of address the Address field contains, followed by up to 254 bytes of data. Table 37 lists the possible values of the Length and Tag fields and describes the type of address stored in the Address field.

Table 37 AFP Network Address fields

Length	Tag	Address
	0x00	Reserved
0x6	0x01	Four-byte IP address
0x8	0x02	Four-byte IP address followed by a two-byte port number
0x6	0x03	DDP address (two bytes for the network number, one byte for the node number, and one byte for the socket number)
Variable	0x04	DNS name (maximum of 254 bytes)
0x8	0x05	IP address (four bytes) with port number (2 bytes). If this tag is present and the client is so configured, the client attempts to build a Secure Shell (SSH) tunnel between itself and the server and tries to connect through it. This functionality is deprecated.
0x12	0x06	IPv6 address (16 bytes)
0x14	0x07	IPv6 address (16 bytes) followed by a two-byte port number

The network address format provides the available network addresses to the AFP client. AFP clients should ignore any tags that it does not recognize.

FPGetSrvrInfo can be called without first establishing a session with the server.

Table 38 describes the reply block for the FPGetSrvrInfo command.

Table 38 Reply block for the FPGetSrvrInfo command

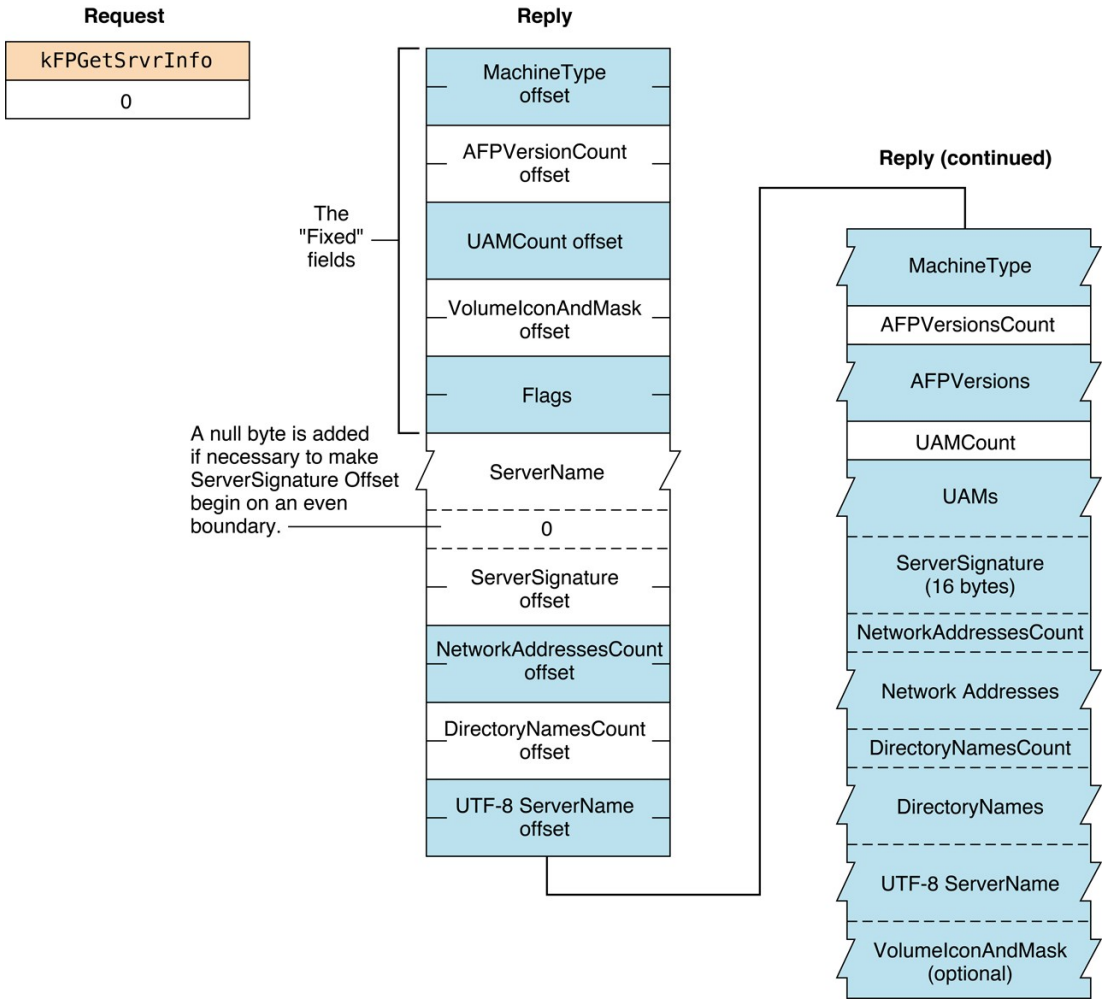
Name and size	Data
MachineType offset	Offset to the location in the reply block containing the server's machine type.

`AFPVersionCount` offset	Offset to the location in the reply block containing the number of AFP versions the server supports. (`AFPVersionCount` is a two-byte integer.)
`UAMCount` offset	Offset to the location in the reply block containing the number of UAMs the server supports. (`UAMCount` is a two-byte integer.)
`VolumeIconAndMask` offset	Offset to the location in the reply block containing volume icon and mask data. This functionality is deprecated in OS X. It consists of a 32-by-32 bit (128 bytes) icon bitmap followed by a 32-by-32 bit (128 bytes) icon mask. The mask usually consists of the icon's outline filled with black (bits that are set). For more information about icons, refer to *Inside OS X*.
`Flags` (`int16_t`)	Flags describing the server's capabilities. For bit definitions, see the section "Server Flags Bitmap."
`ServerName` (`string`)	String containing the server's name. This Pascal string is limited to 32 characters in length.
`ServerSignature` offset	Offset to the location in the reply block containing the server's signature.
`NetworkAddressesCount` offset	Offset to the location in the reply block containing the number of AFP Network Addresses.
`DirectoryNamesCount` offset	Offset to the location in the reply block containing the number of Directory Names.
`UTF8ServerName` offset	Offset to the location in the reply block containing the server's name in UTF-8 characters. See the Character Encoding section of "Apple Filing Protocol Concepts" in *Apple Filing Protocol Programming Guide* for additional details about the UTF-8 encoding used by AFP.
`MachineType` (string)	A string containing a description of the server's hardware, operating system, or both. This Pascal string (up to 16 characters long) has no significance to AFP.
`AFPVersionsCount` (`uint8_t`)	Number of AFP version strings that follow.
`AFPVersions` (packed string)	Each AFP version that the server supports in packed format. For each supported version, there is one byte stating the number of bytes in the version string that follows.
`UAMsCount` (`uint8_t`)	Number of UAM strings that follow.
`UAMs` (packed string)	Each UAM that the server supports in packed format. For each supported UAM, there is one byte stating the number of bytes in the UAM name string that follows. Each string can be up to 16 characters long. For more information, see "Apple Filing Protocol Concepts".
`ServerSignature` (16 bytes)	Sixteen-byte number that uniquely identifies the server, or zero if not supported. For AFP servers, supporting server signatures is optional, but AFP servers must provide a `ServerSignature` offset. An AFP server indicates that it supports server signatures by setting the `kSupportsSrvrSig` bit in the Flags parameter.
`NetworkAddresses` (AFP Network Address)	Server's network addresses, or zero if not supported. (The AFP Network Address format is described later in this section.) For AFP servers, providing a `NetworkAddresses` parameter is optional, but AFP servers must provide a

	`NetworkAddresses` offset. An AFP server indicates that it supports Network Addresses by setting the `kSupportsTCP` bit in the `Flags` parameter.
`DirectoryNames` (string)	String containing the names of directories that Open Directory has made available for sharing, or zero if not supported. For AFP servers, supporting Open Directory is optional, but AFP servers must provide a `DirectoryNames` offset. An AFP server indicates that it supports Open Directory by setting the `kSupportsDirServices` bit in the Flags parameter. If the server supports the Kerberos UAM, it places its principal name in this string.
`UTF8ServerName` (AFPName)	AFPName containing the UTF-8–encoded name of the server. See the Character Encoding section of "Apple Filing Protocol Concepts" in *Apple Filing Protocol Programming Guide* for additional details about the UTF-8 encoding used by AFP.
`VolumeIconAndMask` (256 bytes)	128 bytes of icon data and 128 bytes of mask data. This functionality is deprecated in OS X.

Figure 48 shows the request and reply blocks for the `FPGetSrvrInfo` command.

Figure 48 Request and reply blocks for the `FPGetSrvrInfo` command



FPGetSrvrMsg

Gets a message from a server.

```
uint8_t CommandCode
uint8_t Pad
int16_t MessageType
int16_t MessageBitmap
```

Parameters

CommandCode

`kFPGetSrvrMsg` (38).

Pad

Pad byte.

MessageType

Type of message, were 0 indicates log in and 1 indicates server. (Set `MessageType` to 1 when the Server Message bit in the attention code is set.)

MessageBitmap

Bitmap providing additional information. The client sets bit 0 of this bitmap to indicate it is requesting a message. Starting with AFP 3.0, the client can set bit 1 of this bitmap to indicate that it supports UTF-8 messages. See the Character Encoding section of "Apple Filing Protocol Concepts" in *Apple Filing Protocol Programming Guide* for additional details about the UTF-8 encoding used by AFP.

Result

`kFPNoErr` if no error occurred, `kFPCallNotSupported` if the server does not support this command, `kFPBitmapErr` if unrecognized bits are set in `MessageBitmap`, or `kFPMiscErr` if an error occurred that is not specific to AFP.

ReplyBlock

If the result code is `kFPNoErr`, the server returns a reply block. See Table 39 for the format of the reply block.

Discussion

An AFP client uses the `FPGetSrvrMsg` command to get messages from the server. Usually, the server sends an attention code to the client when server messages are available, and the client responds by calling `FPGetSrvrMsg`. However, the client can call `FPGetSrvrMsg` at any time. If no message is available when the client calls `FPGetSrvrMsg`, the server returns a zero-length string.

There are two message types: log in and server. The log in message type allows the server to send a message to a client at log in time. The client can query the server for a log in message at log in time, or whenever it is convenient to do so. If there is no login message, `FPGetSrvrMsg` returns a zero-length string.

The server message type allows the server to send messages to the client once the client has logged on. The server notifies the client that a server message is available by sending a DSI Attention packet in which the Server Message bit in the `AFPUserBytes` field is set. (See "AFPUserBytes Definitions.")

There are two server message types:

- Shutdown. The server can send a shutdown message to explain why the server is shutting down, how long it will be down, and so on. In addition to setting the Server Message bit in the `AFPUserBytes` field of the DSI Attention packet, the server sets the Shutdown bit to indicate that a shutdown message is available.
- User. The server can send a message to a specific user. The client is made aware that a user message is available when the server sends an DSI Attention packet in which the Server Message bit in the `AFPUserBytes` field is set and the Shutdown bit is not set.

The maximum message size is 255 bytes.

The user must be logged on to the server to receive server message notifications. Otherwise, no special access privileges are necessary to use this command.

Note that in the case of a disconnected session, sending this command does not initiate a reconnect.

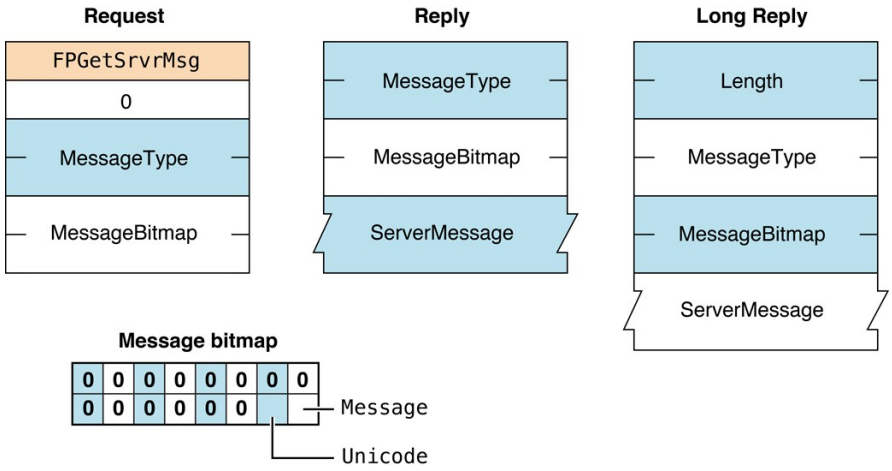
Table 39 describes the reply block for the `FPGetSrvrMsg` command.

Table 39 Reply block for the `FPGetSrvrMsg` command

Name and size	Data
`MessageType` (`int16_t`)	Copy of the input parameter.
`MessageBitmap` (`int16_t`)	Bitmap describing the message. See "FPGetSrvrMsg Bitmap" for a list of possible values.
`ServerMessage` (`string`)	Message from the server. If the message is in UTF-8 format, this field begins with a `uint16_t` length field. If the message is not in UTF-8 format, this field begins with a `uint8_t` length field.

Figure 49 shows the request and reply blocks for the `FPGetSrvrMsg` command.

Figure 49 Request and reply blocks for the `FPGetSrvrMsg` command



FPGetSrvrParms

Gets server parameters.

```
uint8_t CommandCode
uint8_t Pad
```

Parameters

CommandCode

`kFPGetSrvrParms` (16).

Pad

Pad byte.

Result

`kFPNoErr` if no error occurred, `kFPParamErr` if the session reference number is unknown, or `kFPMiscErr` if an error occurred that is not specific to AFP.

ReplyBlock

If the result code is `kFPNoErr`, the server returns a reply block. See Table 40 for the format of the reply block.

Discussion

The `VolName` string, the `HasPassword` bit, and the `HasConfigInfo` bit are packed without padding in the reply block.

For AFP 2.x, this command returns volume names in ANSI format with a maximum length of 27 bytes.

For AFP 3.x, this command returns volume names in UTF-8 format with a one-byte length byte specifying any length up to 255. Early versions of the Finder limited setting volume names to no more than 27 characters, but this limit is no longer enforced. See "AFP Character Encoding" in *Apple Filing Protocol Programming Guide* for additional details about the UTF-8 encoding used by AFP.

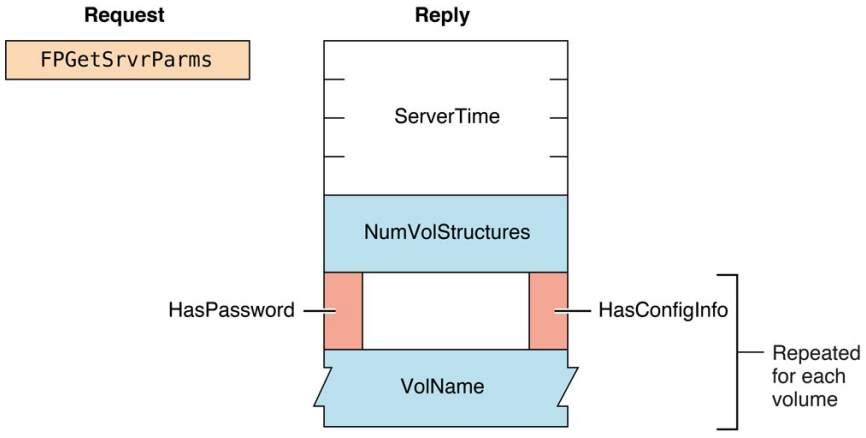
Table 40 describes the reply block for the `FPGetSrvrParms` command.

Table 40 Reply block for the `FPGetSrvrParms` command

Name and size	Data
`ServerTime` (`int32_t`)	Current date and time on the server's clock.
`NumVolStructures` (`int16_t`)	Number of `VolStructure` structures that follow.
`VolStructures`	An array of `VolStructure` structures consisting of the following fields: ▪ `Flags` (`uint8_t`) where bit 0 (`HasConfigInfo`) is set if the volume has configuration information, and bit 7 (`HasPassword`) is set if a password is set for the volume ▪ `VolName` (`string`) name of the volume

Figure 50 shows the request and reply blocks for the `FPGetSrvrParms` command.

Figure 50 Request and reply blocks for the `FPGetSrvrParms` command



FPGetUserInfo

Gets information about a user.

```
uint8_t CommandCode
uint8_t Flags
int32_t UserID
int16_t Bitmap
```

Parameters

CommandCode

`kFPGetUserInfo` (37).

Flags

If the lowest bit (0x1) is set (the `ThisUser` flag), information is obtained about the current user and the `UserID` field is ignored.

UserID

ID of user for whom information is to be retrieved. (Not valid if the `ThisUser` bit is set in the `flags` field.)

This field is deprecated for security reasons. The `ThisUser` bit should always be set in the `flags` field.

Bitmap

Bitmap describing which IDs to retrieve, where bit zero (`0x1`) is set to get the user's User ID, bit 1 (`0x2`) is set to get the user's Primary Group ID, and bit 2 (`0x4`) is set to get the user's UUID.

Result

`kFPNoErr` if no error occurred. See Table 41 for the other possible result codes.

ReplyBlock

If the result code is `kFPNoErr`, the server returns a reply block. See Table 42 for the format of the reply block.

Discussion

The server retrieves the specified information for the specified user and packs them, in bitmap order, in the reply block.

This command can be used only to retrieve the User ID and the Primary Group ID of the user who is the client of this session, thus requiring that the `ThisUser` bit be set. The `UserID` parameter is intended for future use.

Table 41 lists the result codes for the `FPGetUserInfo` command.

Table 41 Result codes for the `FPGetUserInfo` command

Result code	Explanation
`kFPAccessDenied`	User does not have the access privileges required to get information about the specified user.
`kFPBitmapErr`	Attempt was made to retrieve a parameter that cannot be obtained with this command.
`kFPCallNotSupported`	Server does not support this command.
`kFPItemNotFound`	Specified User ID is unknown.
`kFPMiscErr`	Non-AFP error occurred.
`kFPParamErr`	`ThisUser` bit is not set.
`kFPPwdExpiredErr`	User's password has expired. User is required to change his or her password. The user is logged on but can only change his or her password or log out.
`kFPPwdNeedsChangeErr`	User's password needs to be changed. User is required to change his or her password. The user is logged on but can only change his or her password or log out.

If this command returns a result code of `kFPPwdExpiredErr` or `kFPPwdNeedsChangeErr`, the AFP client should display an explanatory dialog box and allow the user to change his or her password.

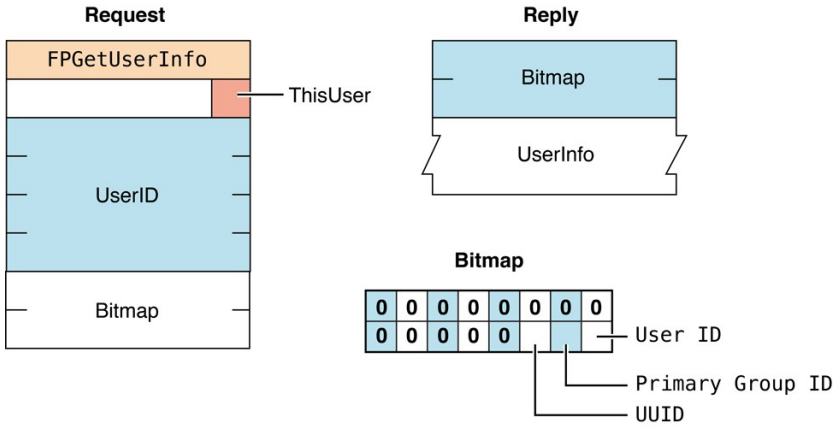
Table 42 describes the reply block for the `FPGetUserInfo` command.

Table 42 Reply block for the `FPGetUserInfo` command

Name and size	Data
`Bitmap` (`int16_t`)	Copy of the input parameter.
`UserInfo`	Requested information, packed in bitmap order, beginning with the lowest bit set. For example, if the UID and UUID bits are set in the reply bitmap, then the UID is first in the reply, followed by the UUID.

Figure 51 shows the request and reply blocks for the `FPGetUserInfo` command.

Figure 51 Request and reply blocks for the `FPGetUserInfo` command



FPGetVolParms

Gets volume parameters.

```
uint8_t CommandCode
uint8_t Pad
int16_t VolumeID
int16_t Bitmap
```

Parameters

CommandCode

`kFPGetVolParms` (17).

Pad

Pad byte.

VolumeID

Volume ID for the volume whose parameters are to be retrieved.

Bitmap

Bitmap describing the parameters that are to be returned. Set the bit of the desired parameter. This bitmap is the same as the bitmap used by the `FPOpenVol` command. For bit definitions for this bitmap, see “Volume Bitmap.”

Result

`kFPNoErr` if no error occurred, `kFPParamErr` if the session reference number or Volume ID is unknown, `kFPBitmapErr` if the specified bitmap has unrecognized bits set, or `kFPMiscErr` if an error occurred that is not

specific to AFP.

ReplyBlock

If the result code is `kFPNoErr`, the server returns a reply block. See Table 43 for the format of the reply block.

Discussion

This command retrieves parameters that describe a volume as specified by the volume's Volume ID.

The server responds to this command by returning a reply block containing a bitmap for the volume parameters and the parameters themselves. All variable-length parameters, such as Volume Name, are at the end of the block. The server represents variable-length parameters in bitmap order as fixed-length offsets (`int16_t` values). These offsets are measured from the start of the parameters (not from the start of the bitmap) to the start of the variable-length parameters. The variable-length parameters are then packed after all fixed-length parameters.

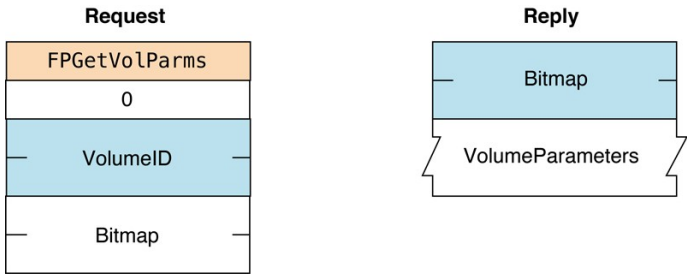
Table 43 describes the reply block for the `FPGetVolParms` command.

Table 43 Reply block for the `FPGetVolParms` command

Name and size	Data
`Bitmap` (`int16_t`)	Copy of the input parameter.
`VolumeParameters`	Volume parameters packed in bitmap order.

Figure 52 shows the request and reply blocks for the `FPGetVolParms` command.

Figure 52 Request and reply blocks for the `FPGetVolParms` command



For the layout of the bitmap and the volume parameters, see the sections "`Volume Attributes Bitmap`" and "Volume Bitmap."

FPListExtAttrs

Gets the names of extended attributes for a file or directory.

```
uint8_t CommandCode
uint8_t Pad
int16_t VolumeID
int32_t DirectoryID
uint16_t Bitmap
int16_t ReqCount
int32_t StartIndex
int32_t MaxReplySize
uint8_t PathType
string Pathname
```

Parameters

CommandCode

kFPListExtAttrs (72).

Pad
Pad byte.

VolumeID
Volume identifier.

DirectoryID
Directory identifier.

Bitmap
Bitmap describing the desired behavior when getting the names of extended attributes. For this command kAttrDontFollow is the only valid bit. For details, see "Extended Attributes Bitmap".

ReqCount
Reserved for future use. For AFP 3.2, set ReqCount to zero. Servers should ignore this parameter.

StartIndex
Reserved for future use. For AFP 3.2, set StartIndex to zero. Servers should ignore this parameter.

MaxReplySize
Maximum size of the reply block, including the size of the Bitmap and DataLength parameters. If MaxReplySize is zero, the server should return the Bitmap and set DataLength to the size of the reply block (the list of extended attribute names) that would be returned without actually sending the names of the extended attributes.

PathType
Type of names in Pathname. See "Path Type Constants" for possible values.

Pathname
Pathname to desired file or directory. Pathname is a string if it contains Short or Long Names or an AFPName if it contains a UTF-8–encoded path. See the Character Encoding section of "Apple Filing Protocol Concepts" in *Apple Filing Protocol Programming Guide* for additional details about the UTF-8 encoding used by AFP.

Result
kFPNoErr if no error occurred. See Table 44 for other possible result codes.

ReplyBlock
If the result code is kFPNoErr, the server returns a reply block. See "Reply block for the FPListExtAttrs command " for the format of the reply block.

Discussion

If the result code is kFPNoErr, this command returns in the reply block the names of extended attributes for the specified file or directory.

Support for this command, as well as FPGetExtAttr, FPRemoveExtAttr and FPSetExtAttr is required in order to support extended attributes. UTF-8 support is also required in order to support extended attributes. See the Character Encoding section of "Apple Filing Protocol Concepts" in *Apple Filing Protocol Programming Guide* for additional details about the UTF-8 encoding used by AFP.

Table 44 lists the possible result codes for the FPListExtAttrs command.

Table 44 Result codes for the FPListExtAttrs command

Result code	Explanation
kFPAccessDenied	User does not have the access privileges required to list the extended attribute names for the specified file or directory.
kFPBitmapErr	Bitmap is null or specifies a value that is invalid for this command.
kFPMiscErr	Non-AFP error occurred.
kFPObjectNotFound	Input parameters do not point to an existing file or directory.

kFPParamErr	A parameter is invalid.

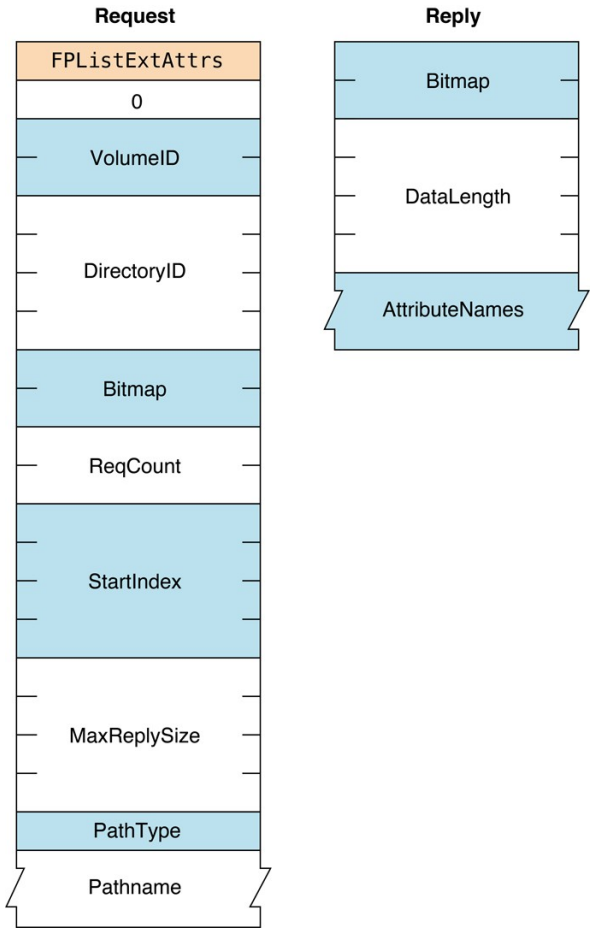
Table 45 describes the reply block for the FPListExtAttrs command.

Table 45 Reply block for the FPListExtAttrs command

Name and size	Data
Bitmap (int16_t)	Reserved.
DataLength (uint32_t)	Length of the data that follows. If MaxReplySize was set to zero, DataLength is set to the size of the list of extended attribute names that would otherwise have been returned.
AttributeNames (string)	Series of null-terminated, UTF-8 encoded extended attribute names if MaxReplySize was not set to zero. See the Character Encoding section of "Apple Filing Protocol Concepts" in *Apple Filing Protocol Programming Guide* for additional details about the UTF-8 encoding used by AFP.

Figure 38 shows the request and reply blocks for the FPListExtAttrs command.

Figure 53 Request and reply blocks for the FPListExtAttrs command



Version Notes

Introduced in AFP 3.2.

FPLogin

Establishes a session with a server.

```
uint8_t CommandCode
string AFPVersion
string UAM
UserAuthInfo
```

Parameters

CommandCode

`kFPLogin` (18).

AFPVersion

String indicating which AFP version to use. For possible values, see "`AFP Version Strings`".

UAM

String indicating which UAM to use. For possible values, see "`AFP UAM Strings`".

UserAuthInfo

UAM-dependent information required to authenticate the user (can be null). The data type of `UserAuthInfo` depends on the UAM specified by `UAM`.

Result

`kFPNoErr` if no error occurred. See Table 46 for the possible result codes.

ReplyBlock

If the result code is `kFPNoErr`, the server returns a reply block. See Table 47 for the format of the reply block.

Discussion

This command establishes an AFP session with an AFP server. Before calling `FPLogin`, the AFP client should call `FPGetSrvrInfo` to obtain the AFP versions and UAMs that the server supports. From the list of AFP versions and UAMs returned by `FPGetSrvrInfo`, the AFP client chooses the highest AFP version and the most secure UAM that the client supports and provides them as the `AFPVersion` and `UAM` parameters to the `FPLogin` command.

If the server returns any result code other than `kFPAuthContinue` or `kFPNoErr`, a session has not been established.

For more detailed information about UAMs, see "File Server Security" in the "Introduction" section.

The AFP server keeps a count of log in attempts that is reset to zero after every successful login. For every failed login attempt without a preceding successful login, the count is incremented. When the maximum number of failed login attempts is reached, the user's account is disabled. Any attempts to log in after the account is disabled yield a result code of `kFPParamErr`, indicating that the user is unknown or that his or her account is disabled. The administrator must enable the user's account again. AFP does not notify the administrator that a user's account has been disabled; the user must notify the administrator by some other means.

Table 46 lists the result codes for the `FPLogin` command.

Table 46 Result codes for the `FPLogin` command

Result code	Explanation
`kFPAuthContinue`	Authentication is not yet complete.
`kFPBadUAM`	Specified UAM is unknown.
`kFPBadVersNum`	Server does not support the specified AFP version.
`kFPCallNotSupported`	Server does not support this command.

kFPMiscErr	User is already authenticated.
kFPNoServer	Server is not responding.
kFPServerGoingDown	Server is shutting down.
kFPUserNotAuth	Authentication failed.
kFPNoMoreSessions	The server cannot handle any additional connections.

After login, the AFP client should immediately call FPGetUserInfo to see if the user's password has expired.

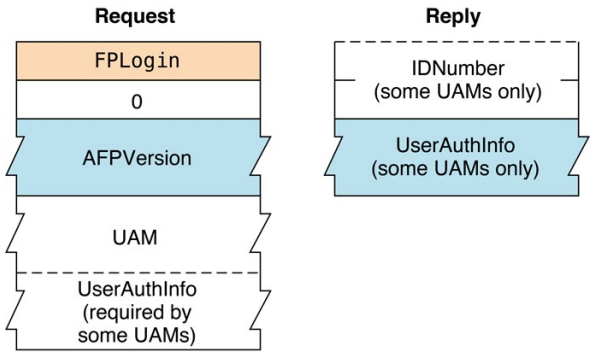
Table 47 describes the reply block for the FPLogincommand.

Table 47 Reply block for the FPLogin command

Name and size	Data
ID (int16_t)	ID returned by certain UAMs to be passed to the FPLoginCont command. (Valid only when kFPAuthContinue is returned as the result code.)
UserAuthInfo	Value returned by certain UAMs. (Valid only when kFPAuthContinue is returned as the result code.)

Figure 54 shows the request and reply blocks for the FPLogin command.

Figure 54 Request and reply blocks for the FPLogin command



Availability

Deprecated in AFP 3.x. Use FPLoginExt instead.

FPLoginCont

Continues the login and user authentication process started by a login command.

```
uint8_t CommandCode
uint8_t Pad
int16_t ID
UserAuthInfo
```

Parameters

CommandCode

`kFPLoginCont` (19).

Pad

Pad byte.

ID

Number returned by a previous call to `FPLogin`, `FPLoginExt`, or `FPLoginCont`.

UserAuthInfo

UAM-dependent information required to authenticate the user (can be null). The data type of `UserAuthInfo` depends on the UAM that was specified when `FPLogin` or `FPLoginExt` was called.

Result

`kFPNoErr` if no error occurred. See Table 48 for the possible result codes.

ReplyBlock

If the result code is `kFPNoErr` or `kFPAuthContinue`, the server may return a reply block, depending on the UAM. See Table 49 for the format of the reply block.

Discussion

This command sends the `ID` and `UserAuthInfo` parameters to the server, which uses them to execute the next step in the UAM. If an additional exchange of packets is required, the server returns a result code of `kFPAuthContinue`. Otherwise, it returns no `kFPNoErr` (meaning the user has been authenticated) or `kFPUserNotAuth` (meaning the authentication has failed). If the server returns `kFPNoErr`, the session is valid. If the server returns `kFPUserNotAuth`, the server also closes the session.

Table 48 lists the result codes for the `FPLoginCont` command.

Table 48 Result codes for the `FPLoginCont` command

Result code	Explanation
`kFPAuthContinue`	Authentication is not yet complete.
`kFPMiscErr`	Non-AFP error occurred.
`kFPNoServer`	Server is not responding.
`kFPParamErr`	Authentication failed for an undisclosed reason.
`kFPUserNotAuth`	User was not authenticated because the password is incorrect.
`kFPNoMoreSessions`	The server cannot handle any additional connections.

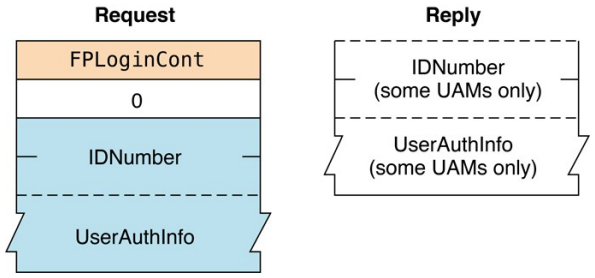
Table 49 describes the reply block for the `FPLoginCont` command.

Table 49 Reply block for the `FPLoginCont` command

Name and size	Data
`ID` (`int16_t`)	ID returned by certain UAMs to be passed to the `FPLoginCont` command. (Valid only if `kFPAuthContinue` is returned as the result code.)
`UserAuthInfo`	Value returned by certain UAMs. (Valid only if `kFPAuthContinue` or `kFPNoErr` is returned as the result code.)

Figure 55 shows the request and reply blocks for the `FPLoginCont` command.

Figure 55 Request and reply blocks for the `FPLoginCont` command



FPLoginExt

Establishes a session with a server using an Open Directory domain.

```
uint8_t CommandCode
uint8_t Pad
int16_t Flags
string AFPVersion
string UAM
uint8_t UserNameType
AFPName UserName
uint8_t PathType
string Pathname
uint8_t Pad
UserAuthInfo
```

Parameters

CommandCode

`kFPLoginExt` (63).

Pad

Pad byte.

Flags

Flags providing additional information. (No flags are currently defined.)

AFPVersion

String indicating which AFP version to use. For possible values, see "`AFP Version Strings`".

UAM

String indicating which UAM to use. For possible values, see "`AFP UAM Strings`".

UserNameType

Type of name in `UserName`; always 3.

UserName

UTF-8–encoded name of the user.

PathType

Type of names in `PathName`. See "Path Type Constants" for possible values.

Pathname

Pathname for the Open Directory domain in which the user specified by `UserName` can be found. `Pathname` is a string if it contains Short or Long Names or an AFPName if it contains a UTF-8–encoded path.

Pad

Pad byte that may be required for `Pathname` to end on an even boundary.

UserAuthInfo

UAM-dependent information required to authenticate the user (can be null). The data type of `UserAuthInfo` is

dependent on the UAM specified by `UAM`.

Result

`kFPNoErr` if no error occurred. See Table 50 for other possible result codes.

ReplyBlock

If the result code is `kFPNoErr` or `kFPAuthContinue`, the server returns a reply block. See Table 51 for the format of the reply block.

Discussion

This command establishes an AFP session using the specified Open Directory domain in which information about the user can be found. Before sending this command, the AFP client should call `FPGetAuthMethods` to obtain the UAMs that the Open Directory domain supports. From the list of UAMs returned by `FPGetAuthMethods`, the AFP client chooses the most secure UAM that it supports and provides it in the `UAM` parameter of the `FPLoginExt` command.

If the server returns any result code other than `kFPAuthContinue` or `kFPNoErr`, a session has not been established.

For more detailed information about UAMs, see “File Server Security” in the “Introduction” section.

See the Character Encoding section of “Apple Filing Protocol Concepts” in *Apple Filing Protocol Programming Guide* for additional details about the UTF-8 encoding used by AFP.

The AFP server keeps a count of log in attempts that is reset to zero after every successful login. For every failed log in attempt without a preceding successful log in, the count is incremented. When the maximum number of failed log in attempts is reached, the user’s account is disabled. Any attempts to log in after the account is disabled result in an `kFPParamErr` indicating that the user is unknown or that his or her account is disabled. The administrator must enable the user’s account again. AFP does not notify the administrator that a user’s account has been disabled; the user must notify the administrator by some other means.

Table 50 lists the result codes for the `FPLoginExt` command.

Table 50 Result codes for the `FPLoginExt` command

Result code	Explanation
`kFPAuthContinue`	Authentication is not yet complete.
`kFPBadUAM`	Specified UAM is unknown.
`kFPBadVersNum`	Server does not support the specified AFP version.
`kFPMiscErr`	User is already authenticated.
`kFPParamErr`	Specified user is unknown or the account has been disabled due to too many login attempts.
`kFPNoServer`	Server is not responding.
`kFPServerGoingDown`	Server is shutting down.
`kFPUserNotAuth`	Authentication failed.
`kFPNoMoreSessions`	The server cannot handle any additional connections.

Table 51 describes the reply block for the `FPLoginExt` command.

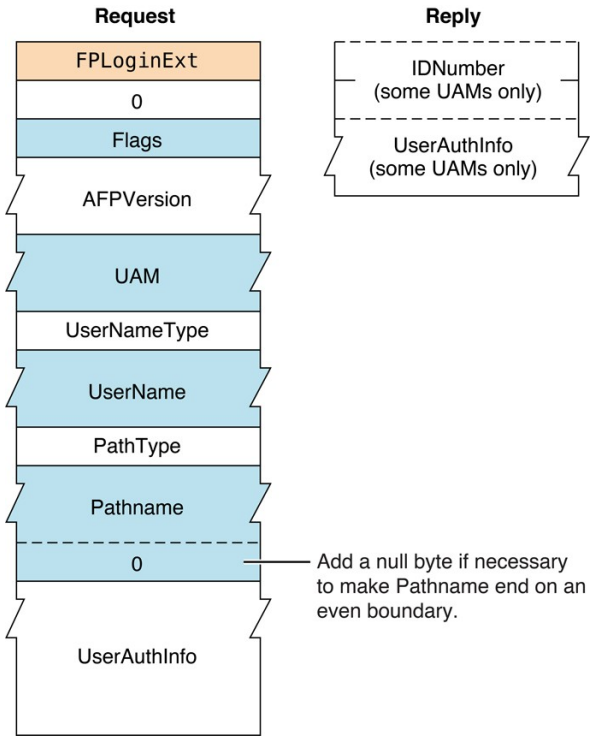
Table 51 Reply block for the `FPLoginExt` command

Name and	Data

size	
`ID` (`int16_t`)	ID returned by certain UAMs to be passed to the FPLoginCont command. (Valid only when `kFPAuthContinue` is returned as the result code.)
`UserAuthInfo`	Value returned by certain UAMs when `kFPAuthContinue` is returned as the result code.

Figure 56 shows the request and reply blocks for the `FPLoginExt` command.

Figure 56 Request and reply blocks for the `FPLoginExt` command



FPLogout

Terminates a session with a server.

```
uint8_t CommandCode
uint8_t Pad
```

Parameters

CommandCode

`kFPLogout` (20).

Pad

Pad byte.

Result

`kFPNoErr` if no error occurred, `kFPParamErr` if the session reference number is unknown, or `kFPMiscErr` if an error occurred that is not specific to AFP.

ReplyBlock

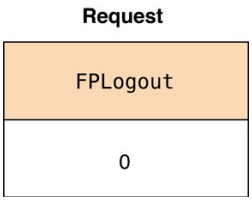
None.

Discussion

This command terminates sessions established by `FPLogin`and `FPLoginExt`. The server flushes and closes any forks opened by the session, frees all session-related resources, and invalidates the session reference number.

Figure 57 shows the request block for the `FPLogout` command.

Figure 57 Request block for the `FPLogout` command



FPMapID

Maps a User ID, Group ID, UUID, or GUID to a name.

```
uint8_t CommandCode
uint8_t Subfunction
int32_t or int64_t ID
```

Parameters

CommandCode

`kFPMapID` (21).

Subfunction

Subfunction code. Possible subfunction codes are listed in “FPMapID Constants.”

See the Character Encoding section of “Apple Filing Protocol Concepts” in *Apple Filing Protocol Programming Guide* for additional details about the UTF-8 encoding used by AFP.

ID

Group ID, User ID, UUID, or GUID to be mapped.

The ID field is an `int32_t` for user and group IDs, or an `int64_t` for UUIDs or GUIDs.

Result

`kFPNoErr` if no error occurred, `kFPParamErr` if the session reference number or subfunction code is unknown, `kFPItemNotFound` if the ID was not found, or `kFPMiscErr` if an error occurred that is not specific to AFP.

ReplyBlock

If the result code is `kFPNoErr`, the server returns a reply block. The reply block differs depending on the subcommand.

For all subcommands except `kUserUUIDToUTF8Name` and `kGroupUUIDToUTF8Name`, the reply block consists of a string, called `Name`, containing the name that corresponds to `ID`. The name can be a string of up to 255 Macintosh Roman characters or an AFPName of up to 255 characters.

For `kUserUUIDToUTF8Name` and `kGroupUUIDToUTF8Name`, the reply block is as follows:

```
uint32_t   objType;   /* 1 if UID, 2 if GID */
uint32_t   id;        /* user or group ID */
uint8_t    name[kAFPMaxFileNameBytes + 1];
```

Note: The `kUserUUIDToUTF8Name` and `kGroupUUIDToUTF8Name` commands can both return user or group IDs because the UUIDs share the same namespace. Clients must check to make sure that the returned `objType` field contains the expected value (1 for a user ID, 2 for a group ID).

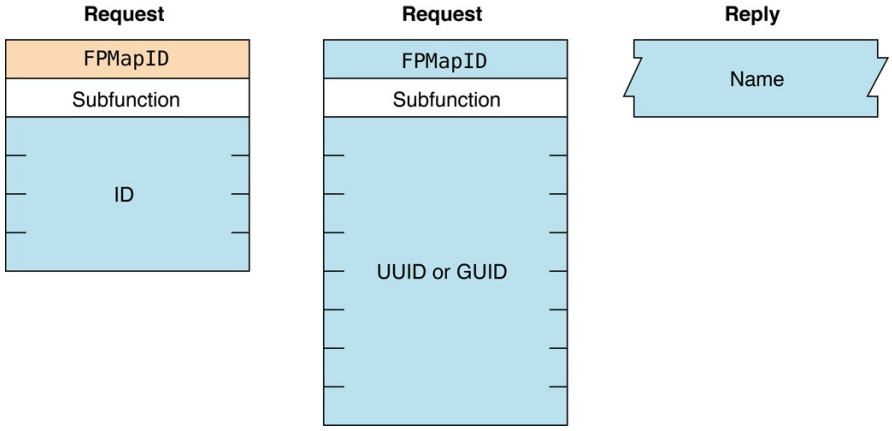
Discussion

The server retrieves the user or group name in that corresponds to the specified User ID, Group ID, UUID, or GUID.

The `Subfunction` parameter tells the server which database (user or group) to search first. User and group IDs come from the same pool of numbers, so if the ID has been assigned, `FPMapID` always returns a user or group name. The subfunction codes are described in "FPMapID Constants."

Figure 58 shows the request and reply blocks for the `FPMapID` command.

Figure 58 Request and reply blocks for the `FPMapID` command



FPMapName

Maps a user name or group name to a User ID, Group ID, UUID, or GUID.

```
uint8_t CommandCode
uint8_t Subfunction
string Name
```

Parameters

CommandCode

`kFPMapName` (22).

Subfunction

Subfunction codes. The subfunction codes are described in "FPMapName Constants."

See the Character Encoding section of "Apple Filing Protocol Concepts" in *Apple Filing Protocol Programming Guide* for additional details about the UTF-8 encoding used by AFP.

Name

Name that is to be mapped to an ID. The name can be a string of up to 255 Macintosh Roman characters or an AFPName of up to 255 characters.

Result

`kFPNoErr` if no error occurred, `kFPParamErr` if the session reference number or subfunction code is unknown, `kFPItemNotFound` if the ID was not found, or `kFPMiscErr` if an error occurred that is not specific to AFP.

ReplyBlock

If the result code is `kFPNoErr`, the server returns a reply block. The reply block consists of an `int32_t`, called `ID`, containing the ID corresponding to the input name.

Discussion

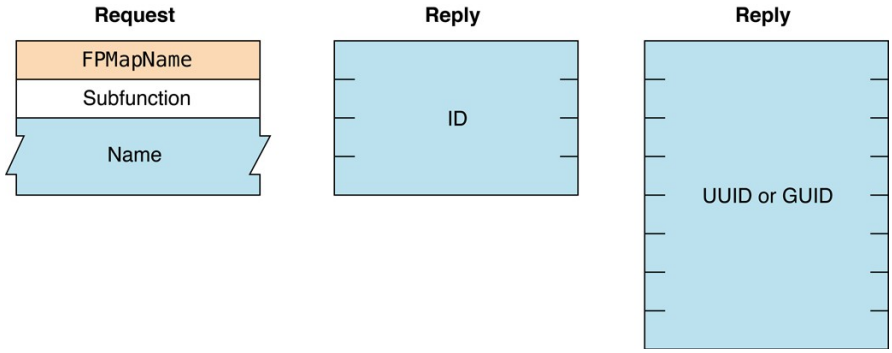
The server retrieves the ID number that corresponds to the specified user or group name or returns a `kFPItemNotFound` result code if it does not find the name in its list of valid names.

The `Subfunction` parameter tells the server which database (user or group) to search first. If you have a user and a

group that are both named “Fred” and you call `FPMapName`, the subfunction code will determine in which database (user or group) the match is found.

Figure 59 shows the request and reply blocks for the `FPMapName` command.

Figure 59 Request and reply blocks for the `FPMapName` command



FPMoveAndRename

Moves a CNode to another location on a volume or renames a CNode.

```
uint8_t CommandCode
uint8_t Pad
int16_t VolumeID
int32_t SourceDirectoryID
int32_t DestDirectoryID
uint8_t SourcePathType
string SourcePathname
uint8_t DestPathType
string DestPathname
uint8_t NewType
string NewName
```

Parameters

CommandCode

`kFPMoveAndRename` (23).

Pad

Pad byte.

VolumeID

Volume ID.

SourceDirectoryID

Source ancestor Directory ID.

DestDirectoryID

Destination ancestor Directory ID.

SourcePathType

Type of names in `SourcePathname`. See “Path Type Constants” for possible values.

SourcePathname

Pathname of the file or directory to be moved (may be null if a directory is being moved). `SourcePathname` is a string if it contains Short or Long Names or an AFPName if it contains a UTF-8–encoded path.

DestPathType

Type of names in `DestPathname`. See “Path Type Constants” for possible values.

DestPathname

Pathname of the file or directory to be moved (may be null if a directory is being moved). `DestPathname` is a string if

it contains Short or Long Names or an AFPName if it contains a UTF-8–encoded path.

NewType

Type of name in `NewName`. See "Path Type Constants" for possible values.

NewName

New name of file or directory (may be null). `NewName` is a string if it contains Short or Long Names or an AFPName if it contains a UTF-8–encoded path.

Result

`kFPNoErr` if no error occurred. See Table 52 for other possible result codes.

ReplyBlock

If the result code is `kFPNoErr`, the server returns a reply block. The reply block consists of one of the following (depending on the request):

An `int32_t` called ID containing the Group or User ID corresponding to the input name.

An `int64_t` called ID containing the UUID or GUID corresponding to the input name.

Discussion

This command copies and optionally renames the CNode and removes the CNode from the original parent directory. If the `NewName` parameter is null, the moved CNode retains it original name. Otherwise, the server moves the CNode, creating the Long or Short Names as described in the section "Catalog Node Names" in Chapter 1. The CNode's modification date and the modification date of the source and destination parent directories are set to the server's clock. The CNode's Parent ID is set to the destination Parent ID. All other parameters remain unchanged, and if the CNode is a directory, the parameters of all descendent directories and files remain unchanged.

The `FPMoveAndRename` command indicates the destination of the move by specifying the ancestor Directory ID and the pathname to the CNode's destination parent directory.

If the CNode being moved is a directory, all its descendants are moved as well.

To move a directory, the user must have search access to all ancestors, down to and including the source and destination parent directories, as well as write access to those directories. To move a file, the user must have search access to all ancestors, except the source and destination parents, as well as read and write access to the source parent directory and write access to the destination parent directory.

A CNode cannot be moved from one volume to another with this command, even if both volumes are managed by the same server.

See the Character Encoding section of "Apple Filing Protocol Concepts" in *Apple Filing Protocol Programming Guide* for additional details about the UTF-8 encoding used by AFP.

Table 52 lists the result codes for the `FPMoveAndRename` command.

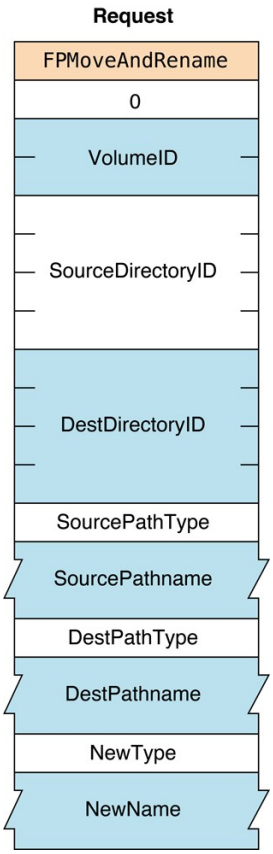
Table 52 Result codes for the `FPMoveAndRename` command

Result code	Explanation
`kFPAccessDenied`	User does not have the access privileges required to move or rename the specified file or directory.
`kFPCantMove`	Attempt was made to move a directory into one of its descendent directories.
`kFPInsideSharedErr`	Directory being moved contains a sharepoint and is being moved into a directory that is shared or is the descendent of a directory that is shared.
`kFPInsideTrashErr`	Shared directory is being moved into the Trash; a directory is being moved to the trash and it contains a shared folder.
`kFPMiscErr`	Non-AFP error occurred.
`kFPObjectExists`	File or directory having the name specified by `NewName` already exists.

kFPObjectLocked	Directory being moved, renamed, or moved and renamed is marked RenameInhibit; file being moved and renamed is marked RenameInhibit.
kFPObjectNotFound	Input parameters do not point to an existing file or directory.
kFPParamErr	Session reference number, Volume ID, or pathname type is unknown; a pathname or NewName is invalid.
kFPVolLocked	Volume is ReadOnly.

Figure 60 shows the request block for the FPMoveAndRename command.

Figure 60 Request block for the FPMoveAndRename command



FPOpenDir

Opens a directory on a variable Directory ID volume and returns its Directory ID.

```
uint8_t CommandCode
uint8_t Pad
int16_t VolumeID
int32_t DirectoryID
uint8_t PathType
string Pathname
```

Parameters

CommandCode

kFPOpenDir (25).

Pad
Pad byte.

VolumeID
Volume ID.

DirectoryID
Ancestor Directory ID.

PathType
Type of names in Pathname. See “Path Type Constants” for possible values.

Pathname
Pathname of the file or directory to be moved (may be null if a directory is being moved). Pathname is a string if it contains Short or Long Names or an AFPName if it contains a UTF-8–encoded path. See the Character Encoding section of “Apple Filing Protocol Concepts” in *Apple Filing Protocol Programming Guide* for additional details about the UTF-8 encoding used by AFP.

Result
kFPNoErr if no error occurred. See Table 53 for other possible result codes.

ReplyBlock
If the result code is kFPNoErr, the server returns a reply block. The reply block consists of an int32_t called DirectoryID containing the Directory ID of the opened directory.

Discussion

If VolumeID specifies a variable Directory ID volume, the server generates a Directory ID for the specified directory. If VolumeID specifies a fixed Directory ID type, the server returns the fixed Directory ID belonging to the directory specified by Pathname.

Although this command can obtain a Directory ID for a directory on a fixed Directory ID volume, the recommended way to obtain a Directory ID for a directory on a fixed Directory ID volume is to call FPGetFileDirParms.

The user must have search access to all ancestors down to and including the specified directory’s parent directory.

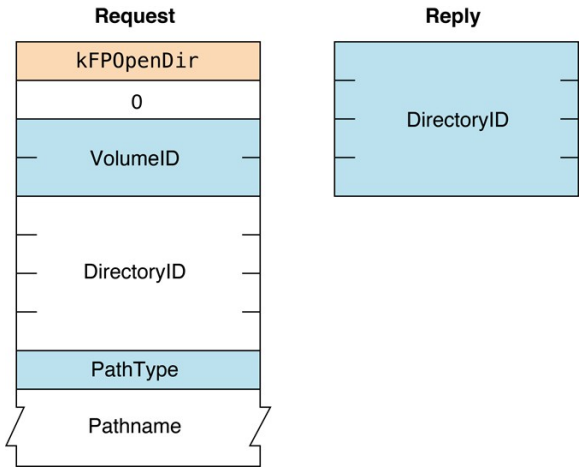
Table 53 lists the result codes for the FPOpenDir command.

Table 53 Result codes for the FPOpenDir command

Result code	Explanation
kFPAccessDenied	User does not have the access privileges required to open the directory.
kFPMiscErr	Non-AFP error occurred.
kFPObjectNotFound	Input parameters do not point to an existing directory.
kFPObjectTypeErr	Input parameters point to a file.
kFPParamErr	Session reference number, Volume ID, or pathname type is unknown; a pathname is invalid.

Figure 61 shows the request and reply blocks for the FPOpenDir command.

Figure 61 Request and reply blocks for the FPOpenDir command



Availability

Deprecated in OS X.

FPOpenDT

Opens the Desktop database on a particular volume.

```
uint8_t CommandCode
uint8_t Pad
int16_t VolumeID
```

Parameters

CommandCode

`kFPOpenDT` (48).

Pad

Pad byte.

VolumeID

Volume ID.

Result

`kFPNoErr` if no error occurred, `kFPParamErr` if the session reference number or `VolumeID` is unknown, or `kFPMiscErr` if an error occurred that is not specific to AFP.

ReplyBlock

If the result code is `kFPNoErr`, the server returns a reply block. The reply block consists of a int16_t, called `DTRefNum`, containing a Desktop database reference number.

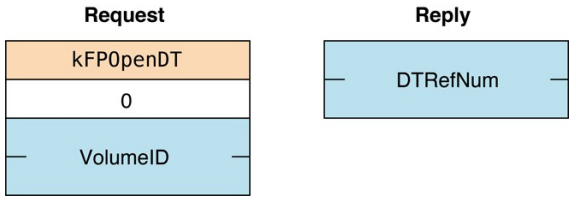
Discussion

The server opens the Desktop database on the selected volume and returns a Desktop database reference number that is unique among such reference numbers. The Desktop database reference number is to be used in all subsequent Desktop database commands relating to this volume.

The user must have previously called `FPOpenVol` for this volume.

Figure 62 shows the request and reply blocks for the `FPOpenDT` command.

Figure 62 Request and reply blocks for the `FPOpenDT` command



Availability

Deprecated in OS X v.10.6.

FPOpenFork

Opens a fork of an existing file for reading or writing.

```
uint8_t CommandCode
uint8_t Flag
int16_t VolumeID
int32_t DirectoryID
int16_t Bitmap
int16_t AccessMode
uint8_t PathType
string Pathname
```

Parameters

CommandCode

`kFPOpenFork` (26).

Flag

Bit 7 of the `Flag` parameter is the `ResourceDataFlag` bit, and it indicates which fork to open, where 0 specifies the data fork and 1 specifies the resource fork.

VolumeID

Volume ID.

DirectoryID

Ancestor Directory ID.

Bitmap

Bitmap describing the fork parameters to be returned. Set the bit that corresponds to each desired parameter. This bitmap is the same as the FileBitmap parameter of the `FPGetFileDirParms` command and can be null. For bit definitions for the File bitmap, see “File and Directory Bitmap.”

AccessMode

Desired access and deny modes, specified by any combination of the following bits:

0 = Read — allows the fork to be read.

1 = Write — allows the fork to be written.

4 = DenyRead — prevents others from reading the fork while it is open.

5 = DenyWrite — prevents others from writing the fork while it is open.

For more information on access and deny modes, see “File Sharing Modes” in *Apple Filing Protocol Programming Guide*.

PathType

Type of names in `Pathname`. See “Path Type Constants” for possible values.

Pathname

Pathname to the desired file (cannot be null). `Pathname` is a string if it contains Short or Long Names or an AFPName if it contains a UTF-8-encoded path. See “AFP Character Encoding” in *Apple Filing Protocol Programming Guide* for additional details about the UTF-8 encoding used by AFP.

Result

kFPNoErr if no error occurred. See Table 54 for the possible result codes.

ReplyBlock
If the result code is kFPNoErr, the server returns a reply block. See Table 55 for the format of the reply block.

Discussion
The server opens the specified fork if the user has the access rights for the requested access mode and if the access mode does not conflict with already-open access paths to the fork.

If the fork is opened, the server returns in the reply block a copy of the input bitmap, an open fork reference number for use with all subsequent commands involving the opened fork, and followed by file parameters packed in bitmap order.

File parameters are returned only if the command completes without error or if the command returns with a kFPDenyConflict result code. In the latter case, the server returns a fork reference of zero.

A kFPBitmapErr result code is returned if an attempt is made to retrieve the length of the file's other fork.

The server needs to keep variable-length parameters, such as Long Name or Short Name, at the end of the reply block. In order to do this, the server represents variable-length parameters in bitmap order as fixed-length offsets (integer) to the start of the variable-length parameters. The actual variable-length fields are then packed after all fixed-length parameters.

If the fork is opened and the user has requested the file's attributes in the file bitmap, the appropriate DAlreadyOpen or RAlreadyOpen bit is set.

To open a fork for read or no access (when neither read or write access is requested), the user must have search access to all ancestors, except the parent directory, as well as read access to the parent directory. For information about access modes, see "File Sharing Modes" in the "Introduction" section.

To open a fork for write access, the volume must not be designated for read-only access. If both forks are currently empty, the user must have search or write access to all ancestors, except the parent directory, as well as write access to the parent directory. If either fork is not empty and one of the forks is being opened for writing, the user must have search access to all ancestors, except the parent directory, as well as read and write access to the parent directory.

The user must have previously called FPOpenVol for this volume. Each fork must be opened separately; a unique fork reference is returned for each fork.

Table 54 lists the result codes for the FPOpenFork command.

Table 54 Result codes for the FPOpenFork command

Result code	Explanation
kFPAccessDenied	User does not have the access privileges required to open the specified fork.
kFPBitmapErr	Attempt was made to retrieve a parameter that cannot be obtained with this command (the fork is not opened).
kFPDenyConflict	File or fork cannot be opened because of a deny modes conflict.
kFPMiscErr	Non-AFP error occurred.
kFPObjectNotFound	Input parameters do not point to an existing file.
kFPObjectLocked	Attempt was made to open a file for writing that is marked WriteInhibit.
kFPObjectTypeErr	Input parameters point to a directory.
kFPParamErr	Session reference number, Volume ID, or pathname type is unknown; a pathname is invalid.

kFPTooManyFilesOpen	Server cannot open another fork.
kFPVolLocked	Attempt was made to open for writing a file on a volume that is marked ReadOnly.

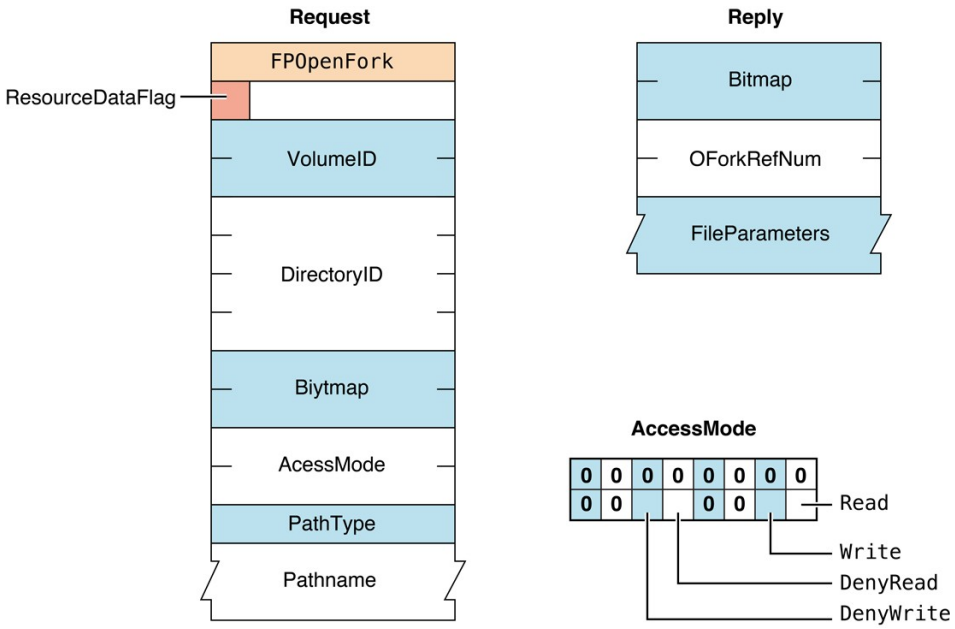
Table 55 describes the reply block for the FPOpenForkcommand.

Table 55 Reply block for the FPOpenFork command

Name and size	Data
Bitmap (int16_t)	Copy of the input parameter.
OForkRefNum (int16_t)	Open fork reference number for use when referring to this fork in when sending subsequent commands.
FileParameters	Requested parameters.

Figure 63 shows the request and reply blocks for the FPOpenFork command.

Figure 63 Request and reply blocks for the FPOpenFork command



FPOpenVol

Opens a volume.

```
uint8_t CommandCode
uint8_t Pad
int16_t Bitmap
string VolumeName
8 bytes Password
```

Parameters

CommandCode
`kFPOpenVol` (24).

Pad
Pad byte.

Bitmap
Bitmap describing the parameters that are to be returned. Set the bit that corresponds to each desired parameter. The bitmap is the same as the Volume bitmap used by the `FPGetVolParms` command and cannot be null. For bit definitions, see "Volume Bitmap."

VolumeName
Name of the volume as returned by `FPGetSrvrParms`.

Password
Optional volume password.

Return Value

Returns `kFPNoErr` if no error occurred. See Table 56 for the possible result codes.

If the result code is `kFPNoErr`, the server returns a reply block. See Table 57 for the format of the reply block.

Discussion

This command must be made before any other command can be made to obtain access to CNodes on the specified volume.

If a password is required to gain access to the volume, it is sent as the `Password` parameter in cleartext. Append null bytes to the password as necessary to obtain a length of eight bytes. Password comparison is case-sensitive. If the supplied password does not match the password kept with the volume, or if a password is not supplied when a password is required, the server returns a result code of `kFPAccessDenied`.

If the passwords match, or if the volume is not password-protected, the server packs the requested parameters in the reply block The user can now send commands related to CNodes on the volume.

The `Bitmap` parameter must request that the Volume ID be returned. There is no other way to retrieve the Volume ID, which is required by most subsequent commands related to this volume.

Table 56 lists the result codes for the `FPOpenVol` command.

Table 56 Result codes for the `FPOpenVol` command

Result code	Explanation
`kFPAccessDenied`	Password is not supplied or does not match.
`kFPBitmapErr`	Attempt was made to retrieve a parameter that cannot be obtained with this command. (The bitmap is null.)
`kFPMiscErr`	Non-AFP error occurred.
`kFPObjectNotFound`	Input parameters do not point to an existing volume.
`kFPParamErr`	Session reference number or volume name is unknown.

Table 57 describes the reply block for the `FPOpenVol` command.

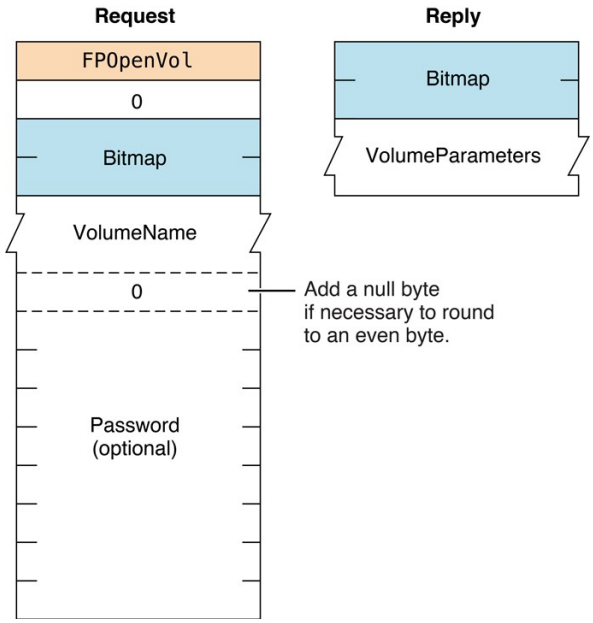
Table 57 Reply block for the `FPOpenVol` command

Name and size	Data

`Bitmap` (`int16_t`)	Copy of the input parameter.
`VolumeParameters`	Requested parameters, including the Volume ID, for the opened volume.

Figure 64 shows the request and reply blocks for the `FPOpenVol` command.

Figure 64 Request and reply blocks for the `FPOpenVol` command



FPRead

Reads a block of data.

```
uint8_t CommandCode
uint8_t Pad
int16_t OForkRefNum
int32_t Offset
int32_t ReqCount
uint8_t NewLineMask
uint8_t NewLineChar
```

Parameters

CommandCode

`kFPRead` (27).

Pad

Pad byte.

OForkRefNum

Open fork reference number.

Offset

Number of the first byte to read.

ReqCount

Number of bytes to read.

NewLineMask

Mask for determining where the read should terminate.

NewLineChar
Character for determining where the read should terminate.

Result
`kFPNoErr` if no error occurred. See Table 58 for the possible result codes.

ReplyBlock
If the result code is `kFPNoErr`, the server returns a reply block containing the data that was read.

Discussion

This command retrieves the specified range of bytes from an open fork. Call `FPOpenFork` to open the fork. The server begins reading at the byte number specified by the `Offset` parameter. Reading stops when one of the following occur:

- The server encounters the character specified by the combination of the `NewLineMask` and `NewLineChar` parameters
- The server reaches the end of the fork
- The server encounters the start of a range locked by another user
- The server reads the number of bytes specified by the `ReqCount` parameter

If the server reaches the end of fork or the start of a locked range, it returns all data read to that point and a result code of `kFPEOFErr` or `kFPLockErr`, respectively.

The `NewLineMask` parameter is a byte mask that is to be logically ANDed with a copy of each byte read. If the result matches the `NewLineChar` parameter, the read terminates. Using a `NewLineMask` value of zero essentially disables the Newline check feature.

If a user reads a byte that was never written to the fork, the result is undefined.

Lock the range to be read before sending this command. The underlying transport mechanism may force the request to be broken into multiple smaller requests. If the range is not locked when this command begins execution, it is possible for another user to lock some or all of the range before this command completes, causing the read to succeed partially.

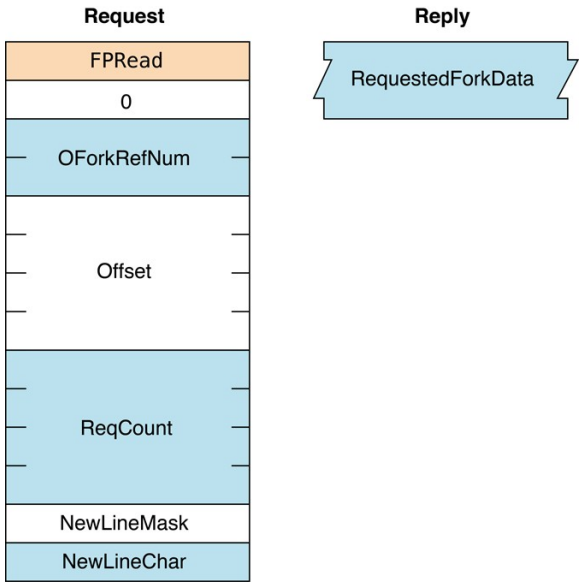
Table 58 lists the result codes for the `FPRead` command.

Table 58 Result codes for the `FPRead` command

Result code	Explanation
`kFPAccessDenied`	Fork was not opened for read access.
`kFPEOFErr`	End of fork was reached.
`kFPLockErr`	Some or all of the requested range is locked by another user.
`kFPMiscErr`	Non-AFP error occurred.
`kFPParamErr`	Session reference number or open fork reference number is unknown; ReqCount or Offset is negative; `NewLineMask` is invalid.

Figure 65 shows the request and reply blocks for the `FPRead` command.

Figure 65 Request and reply blocks for the `FPRead` command



Availability

Deprecated. Use `FPReadExt` instead.

FPReadExt

Reads a block of data.

```
uint8_t CommandCode
uint8_t Pad
int16_t OForkRefNum
int64_t Offset
int64_t ReqCount
```

Parameters

CommandCode

`kFPReadExt` (60).

Pad

Pad byte.

OForkRefNum

Open fork reference number.

Offset

Number of the first byte to read.

ReqCount

Number of bytes to read.

Result

`kFPNoErr` if no error occurred. See Table 59 for the possible result codes.

ReplyBlock

If the result code is `kFPNoErr`, the server returns a reply block containing the data that was read.

Discussion

This command retrieves the specified range of bytes from an open fork. Call `FPOpenFork` to open the fork.

This command differs from the `FPRead` command in that this command is prepared to handle large values that may be returned for files the reside in volumes larger than 4 GB in size. Also, this command does not support the `NewlineMask` and `NewlineChar` parameters that `FPRead` supports.

The server begins reading at the byte number specified by the `Offset` parameter. Reading stops when one of the

following occur:

- The server reaches the end of the fork
- The server encounters the start of a range locked by another user
- The server reads the number of bytes specified by the `ReqCount` parameter

If the server reaches the end of fork or the start of a locked range, it returns all data read to that point and a result code of `kFPEOFErr` or `kFPLockErr`, respectively.

If a user reads a byte that was never written to the fork, the result is undefined.

Lock the range to be read before sending this command. The underlying transport mechanism may force the request to be broken into multiple smaller requests. If the range is not locked when this command begins execution, it is possible for another user to lock some or all of the range before this command completes, causing the read to succeed partially.

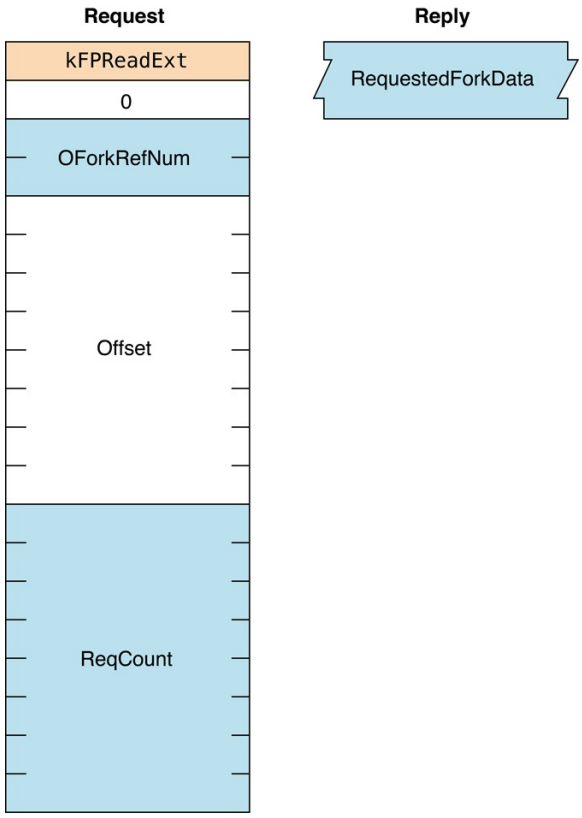
Table 59 lists the result codes for the `FPReadExt` command.

Table 59 Result codes for the `FPReadExt` command

Result code	Explanation
`kFPAccessDenied`	Fork was not opened for read access.
`kFPEOFErr`	End of fork was reached.
`kFPLockErr`	Some or all of the requested range is locked by another user.
`kFPMiscErr`	Non-AFP error occurred.
`kFPParamErr`	Session reference number or open fork reference number is unknown; `ReqCount` or `Offset` is negative.

Figure 66 shows the request and reply blocks for the `FPReadExt` command.

Figure 66 Request and reply blocks for the `FPReadExt` command



FPRemoveAPPL

Removes an APPL mapping from a volume's Desktop database.

```
uint8_t CommandCode
uint8_t Pad
int16_t DTRefNum
int32_t DirectoryID
int32_t FileCreator
uint8_t PathType
string Pathname
```

Parameters

CommandCode

`kFPRemoveAPPL` (54).

Pad

Pad byte.

DTRefNum

Desktop database reference number.

DirectoryID

Ancestor Directory ID.

FileCreator

File creator of the application corresponding to the APPL mapping that is to be removed.

PathType

Type of names in `Pathname`. See "Path Type Constants" for possible values.

Pathname

Pathname to the desired file (cannot be null). `Pathname` is a string if it contains Short or Long Names or an AFPName if it contains a UTF-8-encoded path. See the Character Encoding section of "Apple Filing Protocol Concepts" in *Apple Filing Protocol Programming Guide* for additional details about the UTF-8 encoding used by AFP.

Result

`kFPNoErr` if no error occurred. See Table 60 for the possible result codes.

ReplyBlock

None.

Discussion

The server locates in the Desktop database the APPL mapping corresponding to the specified application and file creator. If an APPL mapping is found, it is removed.

The user must have search access to all ancestors, except the parent directory, as well as read and write access to the parent directory.

The user must have previously called `FPOpenDT` for the corresponding volume. In addition, the file must exist in the specified directory before this command is sent.

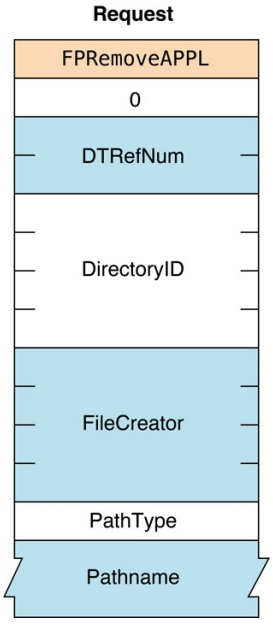
Table 60 lists the result codes for the `FPRemoveAPPL` command.

Table 60 Result codes for the `FPRemoveAPPL` command

Result code	Explanation
`kFPAccessDenied`	User does not have the access privileges required to use this command.
`kFPItemNotFound`	No APPL mapping corresponding to the input parameters was found in the Desktop database.
`kFPMiscErr`	Non-AFP error occurred.
`kFPObjectNotFound`	Input parameters do not point to an existing file.
`kFPParamErr`	Session reference number or Desktop database reference number is unknown.

Figure 67 shows the request and reply blocks for the `FPRemoveAPPL` command.

Figure 67 Request and reply blocks for the `FPRemoveAPPL` command



Availability

Deprecated in OS X v.10.6.

FPRemoveComment

Removes a comment from a volume's Desktop database.

```
uint8_t CommandCode
uint8_t Pad
int16_t DTRefNum
int32_t DirectoryID
uint8_t PathType
string Pathname
```

Parameters

CommandCode

`kFPRemoveComment` (57).

Pad

Pad byte.

DTRefNum

Desktop database reference number.

DirectoryID

Ancestor Directory ID.

PathType

Type of names in `Pathname`. See "Path Type Constants" for possible values.

Pathname

Pathname to the CNode whose comment is being removed (cannot be null). `Pathname` is a string if it contains Short or Long Names or an AFPName if it contains a UTF-8–encoded path. See the Character Encoding section of "Apple Filing Protocol Concepts" in *Apple Filing Protocol Programming Guide* for additional details about the UTF-8 encoding used by AFP.

Result

`kFPNoErr` if no error occurred. See Table 61 for the possible result codes.

ReplyBlock

None.

Discussion

If the comment is associated with directory that is not empty, the user must have search access to all ancestors, including the parent directory, plus write access to the parent directory. If the comment is associated with an empty directory, the user must have search or write access to all ancestors, including the parent directory, plus write access to the parent directory.

If the comment is associated with a file that is not empty, the user must have search access to all ancestors, except the parent directory, plus read and write access to the parent directory. If the comment is associated with an empty file, the user must have search or write access to all ancestors, except the parent directory, plus write access to the parent directory.

The user must have previously called `FPOpenDT` for the corresponding volume.

Table 61 lists the result codes for the`FPRemoveComment` command.

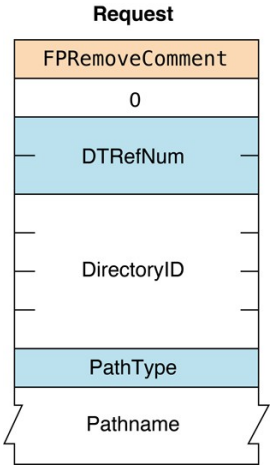
Table 61 Result codes for the `FPRemoveComment` command

Result code	Explanation
`kFPAccessDenied`	User does not have the access privileges required to use this command.

`kFPItemNotFound`	Comment was not found in the Desktop database.
`kFPMiscErr`	Non-AFP error occurred.
`kFPObjectNotFound`	Input parameters do not point to an existing file or directory.
`kFPParamErr`	Session reference number, Desktop database reference number, or pathname type is unknown; pathname is invalid.

Figure 68 shows the request and reply blocks for the `FPRemoveComment` command.

Figure 68 Request and reply blocks for the `FPRemoveComment` command



Availability

Deprecated in OS X v.10.6.

FPRemoveExtAttr

Removes an extended attribute.

```
uint8_t CommandCode
uint8_t Pad
int16_t VolumeID
int32_t DirectoryID
uint16_t Bitmap
uint8_t PathType
string Pathname
uint8_t Pad
uint16_t NameLength
string Name
```

Parameters

CommandCode

`kFPRemoveExtAttr` (71).

Pad

Pad byte.

VolumeID

Volume identifier.

DirectoryID

Directory identifier.

Bitmap

Bitmap specifying the desired behavior when removing an extended attribute. For this command, `kAttrDontFollow` is the only valid bit. For details, see "`Extended Attributes Bitmap`".

PathType

Type of names in `Pathname`. See "Path Type Constants" for possible values.

Pathname

Pathname to desired file or directory. `Pathname` is a string if it contains Short or Long Names or an AFPName if it contains a UTF-8–encoded path.

Pad

Optional pad byte if needed to pad to an even boundary.

NameLength

Length in bytes of the extended attribute name that follows.

Name

UTF-8–encoded name of the extended attribute that is to be removed.

Result

`kFPNoErr` if no error occurred. See Table 62 for other possible result codes.

Discussion

This command removes the specified extended attribute.

Support for this command, as well as `FPGetExtAttr`, `FPListExtAttrs`, and `FPSetExtAttr` is required in order to support extended attributes. UTF-8 support is also required in order to support extended attributes. See the Character Encoding section of "Apple Filing Protocol Concepts" in *Apple Filing Protocol Programming Guide* for additional details about the UTF-8 encoding used by AFP.

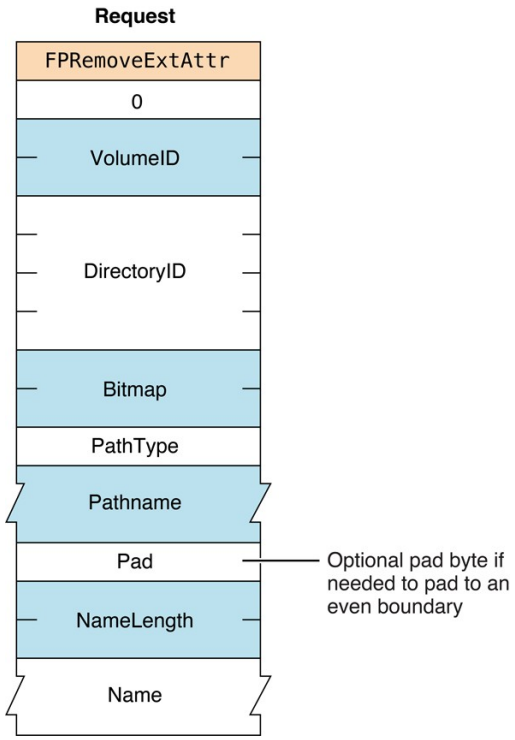
Table 62 lists the possible result codes for the `FPRemoveExtAttr` command.

Table 62 Result codes for the `FPRemoveExtAttr` command

Result code	Explanation
`kFPAccessDenied`	User does not have the access privileges required to remove an extended attribute for the specified file or directory.
`kFPBitmapErr`	Bitmap is null or specifies a value that is invalid for this command.
`kFPMiscErr`	Non-AFP error occurred.
`kFPObjectNotFound`	Input parameters do not point to an existing file or directory.
`kFPParamErr`	A parameter is invalid.

Figure 69 shows the request block for the `FPRemoveExtAttr` command.

Figure 69 Request block for the `FPRemoveExtAttr` command



Version Notes

Introduced in AFP 3.2.

FPRename

Renames a file or directory.

```
uint8_t CommandCode
uint8_t Pad
int16_t VolumeID
int32_t DirectoryID
uint8_t PathType
string Pathname
uint8_t NewType
string NewName
```

Parameters

CommandCode

`kFPRename` (28).

Pad

Pad byte.

VolumeID

Volume ID.

DirectoryID

Ancestor Directory ID.

PathType

Type of names in `Pathname`. See “Path Type Constants” for possible values.

Pathname

Pathname to the CNode whose name is being changed (cannot be null). `Pathname` is a string if it contains Short or Long Names or an AFPName if it contains a UTF-8-encoded path.

NewType

Type of names in `NewName`. See “Path Type Constants” for possible values.

NewName

Pathname to the CNode, including its new name (cannot be null). `NewName` is a string if it contains Short or Long Names or an AFPName if it contains a UTF-8–encoded path.

Result

`kFPNoErr` if no error occurred. See Table 63 for the possible result codes.

ReplyBlock

None.

Discussion

The server assigns the new name to the file or directory. The other name (Long or Short) is generated as described in the section “Catalog Node Names” in Chapter 1. The modification date of the parent directory is set to the server’s clock.

To rename a directory, the user must have search access to all ancestors. including the CNode’s parent directory, as well as write access to the parent directory. To rename a file, the user must have search access to all ancestors, except the CNode’s parent directory, as well as read and write access to the parent directory.

See the Character Encoding section of “Apple Filing Protocol Concepts” in *Apple Filing Protocol Programming Guide* for additional details about the UTF-8 encoding used by AFP.

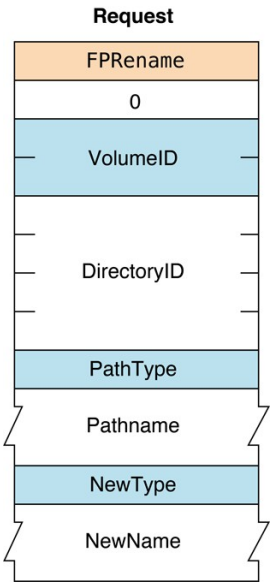
Table 63 lists the result codes for the `FPRename` command.

Table 63 Result codes for the `FPRename` command

Result code	Explanation
`kFPAccessDenied`	User does not have the access privileges required to use this command.
`kFPCantRename`	Attempt was made to rename a volume or root directory.
`kFPMiscErr`	Non-AFP error occurred.
`kFPObjectExists`	File or directory having the name specified by `NewName` already exists.
`kFPObjectLocked`	File or directory is marked RenameInhibit.
`kFPObjectNotFound`	Input parameters do not point to an existing file or directory.
`kFPParamErr`	Session reference number, Volume ID, or pathname type is unknown; pathname or `NewName` is invalid.
`kFPVolLocked`	Volume is ReadOnly

Figure 70 shows the request block for the `FPRename` command.

Figure 70 Request block for the `FPRename` command



FPResolveID

Gets parameters for a file by File ID.

```
uint8_t CommandCode
uint8_t Pad
int16_t VolumeID
int32_t FileID
int16_t Bitmap
```

Parameters

CommandCode

`kFPResolveID` (41).

Pad

Pad byte.

VolumeID

Volume ID.

FileID

File ID to be resolved.

Bitmap

Bitmap describing the parameters to return. Set the bit that corresponds to each desired parameter. This bitmap is the same as the `FileBitmap` parameter of the `FPGetFileDirParms` command. For bit definitions for the this bitmap, see “File and Directory Bitmap.”

Result

`kFPNoErr` if no error occurred. See Table 64 for the possible result codes.

ReplyBlock

If the result code is `kFPNoErr`, the server returns a reply block. See Table 65 for the format of the reply block.

Discussion

The parameters returned by this command can be any parameter specified in the `FPGetFileDirParms` command.

The user must have the Read Only or the Read & Write privilege to use this command.

Table 64 lists the result codes for the `FPResolveID` command.

Table 64 Result codes for the `FPResolveID` command

Result code	Explanation
`kFPAccessDenied`	User does not have the access privileges required to use this command.
`kFPBadIDErr`	File ID is not valid.
`kFPCallNotSupported`	Server does not support this command.
`kFPIDNotFound`	File ID was not found. (No file thread exists.)
`kFPMiscErr`	Non-AFP error occurred.
`kFPParamErr`	Session reference number, Volume ID, or File ID is unknown.

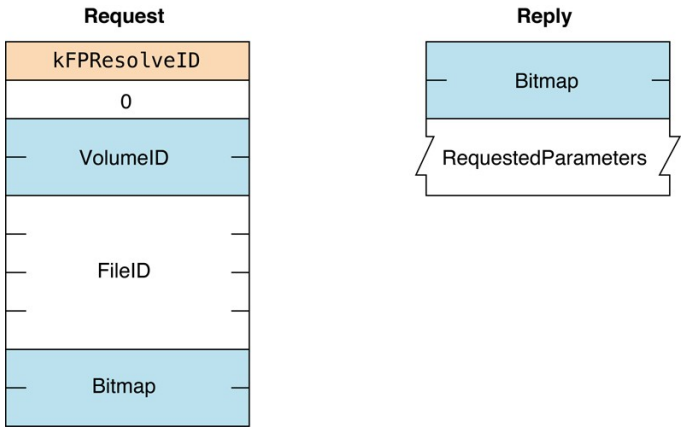
Table 65 describes the reply block for the `FPResolveID` command.

Table 65 Reply block for the `FPResolveID` command

Name and size	Data
`Bitmap` (`int16_t`)	Copy of the input bitmap.
`FileParameters`	Requested file parameters.

Figure 70 shows the request and reply blocks for the `FPResolveID` command.

Figure 71 Request and reply blocks for the `FPResolveID` command



FPSetACL

Sets the UUID, Group UUID, and ACL for a file or directory and removes an ACL from a file or directory.

```
uint8_t CommandCode
uint8_t Pad
int16_t VolumeID
int32_t DirectoryID
```

```
uint16_t Bitmap
uint8_t Pathtype
string Pathname
uint8_t Pad
AdditionalInformation
```

Parameters

CommandCode

`kFPSetACL` (74).

Pad

Pad byte.

VolumeID

Volume identifier.

DirectoryID

Directory identifier.

Bitmap

Bits that specify the values that are to be set. Specify `kFileSec_UUID` to set the UUID of the specified file or directory. Specify `kFileSec_GRPUUID` to set the Group UUID of the specified file or directory. Specify `kFileSec_ACL` to set the ACL of the specified file or directory or `kFileSec_REMOVEACL` to remove the file or directory's ACL.

If sending this command is part of the creation of a new item, set the `kFileSec_Inherit` bit. When the server receives an `FPSetACL` command in which the `kFileSec_Inherit` bit is set in its `Bitmap` parameter, the server scans the current item looking for access control entries (ACEs) in which the `KAUTH_ACE_INHERITED` bit is set in the `ace_flags` field. The server copies any currently inherited ACEs to the end of the incoming list of ACEs and sets the ACL on the item. For declarations of these constants, see "Access Control List Bitmap."

PathType

Type of names in `Pathname`. See "Path Type Constants" for possible values.

Pathname

Pathname of the Open Directory domain for which UAMs are to be obtained. `Pathname` is a string if it contains Short or Long Names or an AFPName if it contains a UTF-8-encoded path. See the Character Encoding section of "Apple Filing Protocol Concepts" in *Apple Filing Protocol Programming Guide* for additional details about the UTF-8 encoding used by AFP.

Pad

Pad byte if needed to pad to an even boundary.

AdditionalInformation

If `kFileSec_UUID` is set in the `Bitmap` parameter, the first item in this parameter is the UUID that is to be set. If `kFileSec_GRPUUID` is set, the next item in this parameter is the Group UUID that is to be set. If `kFileSec_ACL` is set, the next item in this parameter is a `kauth_acl` structure. For information on this structure, see the section `Access Control List Structure`. If `kFileSec_REMOVEACL` is set in the `Bitmap` parameter, this parameter does not contain a `kauth_acl` structure.

Result

`kFPNoErr` if no error occurred. See Table 66 for other possible result codes.

Discussion

Depending on the bits that are set in the `Bitmap` parameter, this command sets the UUID, Group UUID, and ACL for the specified file or directory or removes the ACL of the specified file or directory.

Support for this command, as well as `FPAccess` and `FPGetACL` is required in order to support access control lists (ACLs). Support for UTF-8 and UUIDs is also required in order to support ACLs. See the Character Encoding section of "Apple Filing Protocol Concepts" in *Apple Filing Protocol Programming Guide* for additional details about the UTF-8 encoding used by AFP.

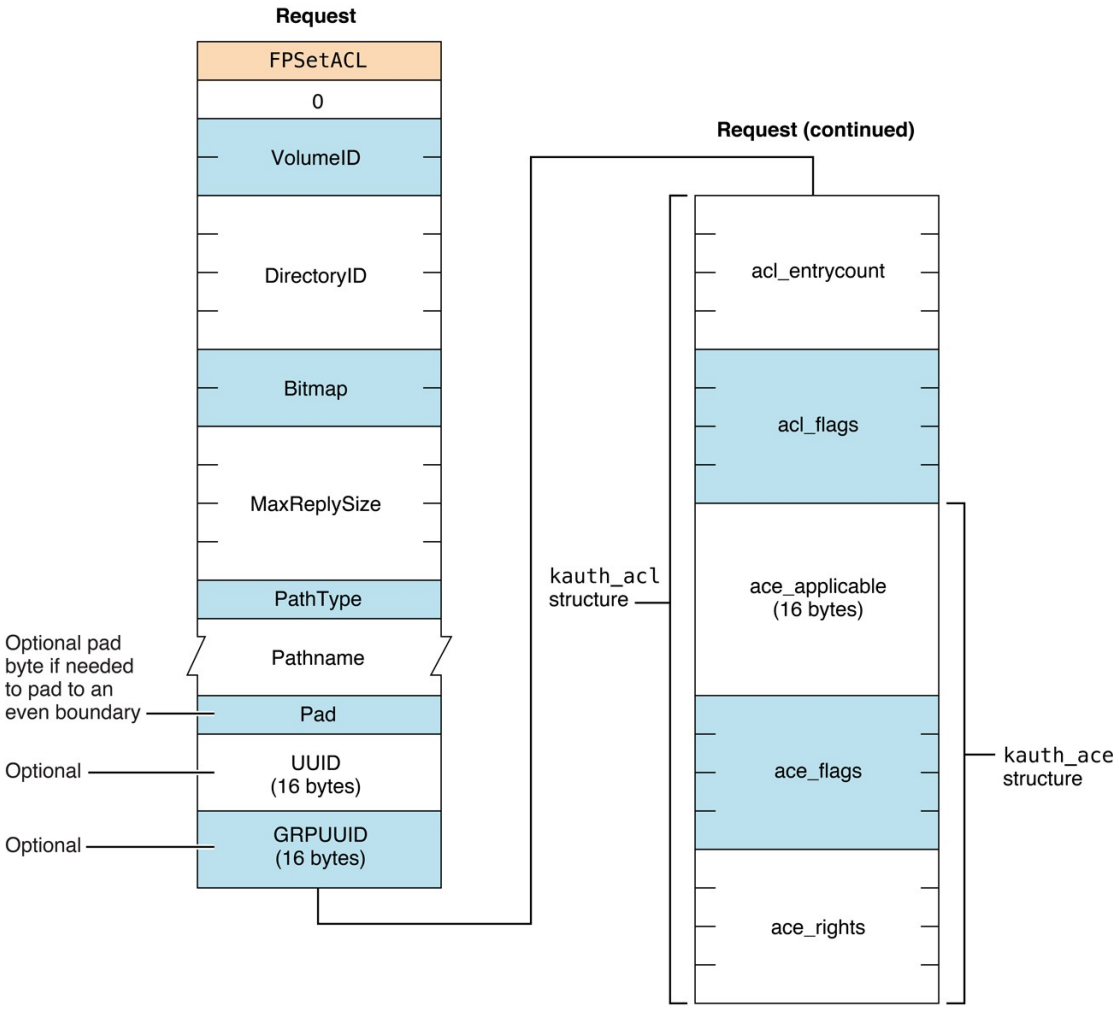
Table 66 lists the result codes for the `FPSetACL` command.

Table 66 Result codes for the `FPSetACL` command

Result code	Explanation
`kFPAccessDenied`	User does not have the access rights required to set the ACL for the specified file or directory.
`kFPMiscErr`	Non-AFP error occurred.
`kFPObjectNotFound`	Input parameters do not point to an existing file or directory.
`kFPParamErr`	A parameter is invalid.

Figure 36 shows the request block for the `FPSetACL` command.

Figure 72 Request block for the `FPSetACL` command



Version Notes

Introduced in AFP 3.2.

FPSetDirParms

Sets parameters for a directory.

```
uint8_t CommandCode
uint8_t Pad
int16_t VolumeID
int32_t DirectoryID
int16_t Bitmap
uint8_t PathType
string Pathname
DirectoryParameters
```

Parameters

CommandCode

`kFPSetDirParms` (29).

Pad

Pad byte.

VolumeID

Volume ID.

DirectoryID

Ancestor Directory ID.

Bitmap

Bitmap describing the parameters to set. Set the bit that corresponds to each desired parameter. This bitmap is the same as the `DirectoryBitmap` parameter of the `FPGetFileDirParms` command. For bit definitions for this bitmap, see “File and Directory Bitmap.”

PathType

Type of name in `Pathname`. See “Path Type Constants” for possible values.

Pathname

Pathname to the desired directory. `Pathname` is a string if it contains Short or Long Names or an AFPName if it contains a UTF-8–encoded path. See the Character Encoding section of “Apple Filing Protocol Concepts” in *Apple Filing Protocol Programming Guide* for additional details about the UTF-8 encoding used by AFP.

DirectoryParameters

Parameters to be set, packed in bitmap order.

Result

`kFPNoErr` if no error occurred. See Table 67 for the possible result codes.

ReplyBlock

None.

Discussion

This command sets or clears certain parameters and attributes that are common to both files and directories. The parameters are the Invisible and System attributes, Creation Date, Modification Date, Backup Date, Finder Info, and UNIX privileges.

The parameters must be packed, in bitmap order, in the request block. Variable-length parameters, such as Long Name and Short Name, must be kept at the end of the block. To do this, variable-length parameters are represented in bitmap order as fixed-length offsets (integers). These offsets are measured from the start of the parameters to the start of the variable-length parameters. The actual variable-length parameters are then packed after all fixed-length parameters.

Changing a directory’s access rights immediately affects other open sessions. If the user does not have the access rights to set one of the parameters, a `kFPAccessDenied` result code is returned and no parameters are set.

To set a directory’s access privileges, Owner ID, Group ID, or to change the DeleteInhibit, RenameInhibit, WriteInhibit, or Invisible attributes, the user must have search or write access to all ancestors, including this directory’s parent directory, and the user must be the owner of the directory. To set any parameter other than the ones mentioned above for an empty directory, the user must have search or write access to all ancestors, except the parent directory, as well as write access to the parent directory. To set any parameter other than the ones mentioned above for a directory that is not empty, the user must have search access to all ancestors, including the parent directory, as well as write access to the parent directory.

This command cannot be used to set a directory's name; instead, use `FPRename`. This command cannot be used to set a directory's Parent Directory ID; instead, use `FPMoveAndRename`. This command cannot be used to set a directory's Directory ID or Offspring Count.

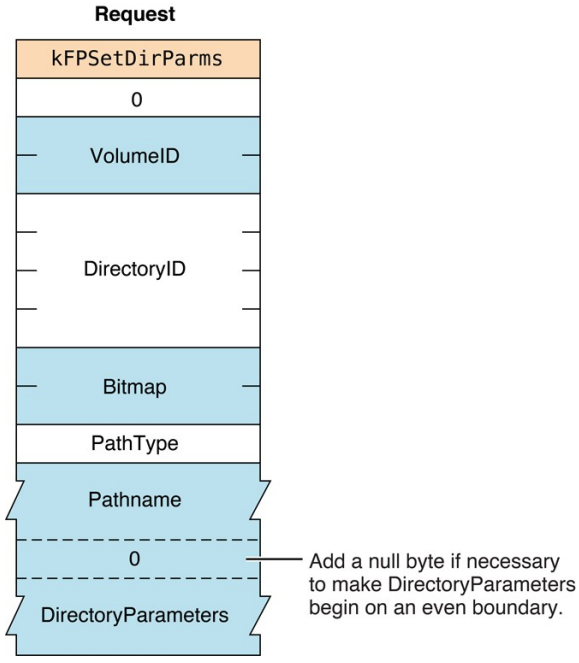
Table 67 lists the result codes for the `FPSetDirParms` command.

Table 67 Result codes for the `FPSetDirParms` command

Result code	Explanation
`kFPAccessDenied`	User does not have the access privileges required to use this command.
`kFPBitmapErr`	Attempt was made to set a parameter that cannot be set by this command; bitmap is null.
`kFPMiscErr`	Non-AFP error occurred.
`kFPObjectNotFound`	Input parameters do not point to an existing directory.
`kFPObjectTypeErr`	Input parameters point to a file.
`kFPParamErr`	Session reference number, Volume ID, or pathname type is unknown; pathname, Owner ID, or Group ID is invalid.
`kFPVolLocked`	Volume is ReadOnly.

Figure 73 shows the request block for the `FPSetDirParms` command.

Figure 73 Request block for the `FPSetDirParms` command



FPSetExtAttr

Sets the value of an extended attribute.

```
uint8_t CommandCode
uint8_t Pad
int16_t VolumeID
int32_t DirectoryID
uint16_t Bitmap
int64_t Offset
uint8_t PathType
string Pathname
uint8_t Pad
uint16_t NameLength
string Name
uint32_t AttributeDataLength
string AttributeData
```

Parameters

CommandCode

`kFPSetExtAttr` (70).

Pad

Pad byte.

VolumeID

Volume identifier.

DirectoryID

Directory identifier.

Bitmap

Bitmap specifying the desired behavior when setting the value of an extended attribute. For details, see "`Extended Attributes Bitmap`" for details.

Offset

Always zero; reserved for future use.

PathType

Type of names in `Pathname`. See "Path Type Constants" for possible values.

Pathname

Pathname to desired file or directory. `Pathname` is a string if it contains Short or Long Names or an AFPName if it contains a UTF-8–encoded path.

Pad

Optional pad byte if needed to pad to an even boundary.

NameLength

Length in bytes of the extended attribute name that follows.

Name

UTF-8–encoded name of the extended attribute that is to be set.

AttributeDataLength

Length in bytes of the extended attribute data that follows.

AttributeData

Value to which the extended attribute is to be set.

Result

`kFPNoErr` if no error occurred. See Table 68 for other possible result codes.

Discussion

This command sets the value of the specified extended attribute. If the extended attribute does not already exist, it is created.

Support for this command, as well as `FPGetExtAttr`, `FPListExtAttrs` and `FPRemoveExtAttr` is required in order to support extended attributes. UTF-8 support is also required in order to support extended attributes. See the Character Encoding section of "Apple Filing Protocol Concepts" in *Apple Filing Protocol Programming Guide* for additional details about the UTF-8 encoding used by AFP.

Note: The maximum attribute length that the `FPGetExtAttr` and `FPSetExtAttr` commands can handle is the lesser of the server's quantum size (see `DSIOpenSession` and "AFP Over TCP") and the maximum extended attribute length that the backing filesystem can handle.

For example, if the AFP Server is sharing part of an HFS+ volume, the maximum length of the extended attribute is either the AFP server quantum size or the HFS+ maximum extended attribute length, whichever is smaller.

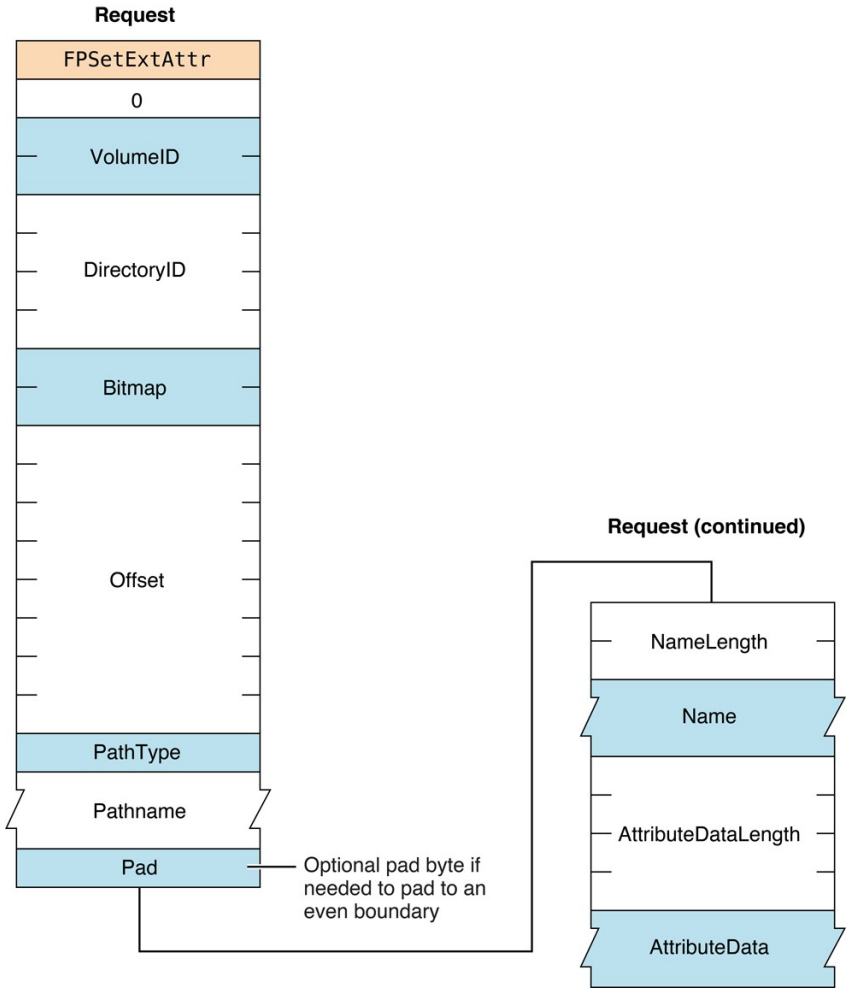
Table 68 lists the possible result codes for the `FPSetExtAttr` command.

Table 68 Result codes for the `FPSetExtAttr` command

Result code	Explanation
`kFPAccessDenied`	User does not have the access privileges required to set an extended attribute for the file or directory.
`kFPBitmapErr`	Bitmap is null or specifies a value that is invalid for this command.
`kFPMiscErr`	Non-AFP error occurred.
`kFPObjectNotFound`	Input parameters do not point to an existing file or directory.
`kFPParamErr`	A parameter is invalid.

Figure 74 shows the request block for the `FPSetExtAttr` command.

Figure 74 Request block for the `FPSetExtAttr` command



Version Notes

Introduced in AFP 3.2.

FPSetFileDirParms

Sets parameters for a file or a directory.

```
uint8_t CommandCode
uint8_t Pad
int16_t VolumeID
int32_t DirectoryID
int16_t Bitmap
uint8_t PathType
string Pathname
FileDirParameters
```

Parameters

CommandCode

`kFPSetFileDirParms` (35).

Pad

Pad byte.

VolumeID

Volume ID.

DirectoryID

Ancestor Directory ID.

Bitmap

Bitmap describing the parameters to set. Set the bit that corresponds to each desired parameter. This bitmap can be the same as the `DirectoryBitmap` or the `FileBitmap` parameter of the `FPGetFileDirParms` command, but this command can only set the parameters that are common to both bitmaps. For bit definitions for this bitmap, see "File and Directory Bitmap."

PathType

Type of name in `Pathname`. See "Path Type Constants" for possible values.

Pathname

Pathname to the desired file or directory. `Pathname` is a string if it contains Short or Long Names or an AFPName if it contains a UTF-8–encoded path. See the Character Encoding section of "Apple Filing Protocol Concepts" in *Apple Filing Protocol Programming Guide* for additional details about the UTF-8 encoding used by AFP.

FileDirParameters

Parameters to be set, packed in bitmap order.

Result

`kFPNoErr` if no error occurred. See Table 69 for the possible result codes.

ReplyBlock

None.

Discussion

This command sets or clears certain parameters and attributes that are common to both files and directories. The parameters are the Invisible and System attributes, Creation Date, Modification Date, Backup Date, Finder Info, and UNIX privileges.

The parameters must be packed, in bitmap order, in the request block. Variable-length parameters, such as Long Name and Short Name, must be kept at the end of the block. To do this, variable-length parameters are represented in bitmap order as fixed-length offsets (integers). These offsets are measured from the start of the parameters to the start of the variable-length parameters. The actual variable-length parameters are then packed after all fixed-length parameters.

If necessary, a null byte must be added between `Pathname` and `DirectoryParameters` in the request block to make `DirectoryParameters` begin on an even boundary.

If the Attributes parameter is included, the Set/Clear bit indicates that the specified attributes are to be set (1) or cleared (0). Therefore, it is not possible to set some attributes and clear other attributes in the same command.

If this command changes the CNode's attributes or sets the CNode's dates (except modification date), Finder Info, or UNIX privileges, the modification date of the CNode is set to the server's clock. If this command changes the CNode's Invisible attribute, the modification date of the CNode's parent directory is set to the server's clock.

To set the parameters for a directory that is not empty, the user needs search access to all ancestors, including the parent directory, as well as write access to the parent directory. To set parameters for an empty directory, the user needs search or write access to all ancestors, except the parent directory, as well as write access to the parent directory.

To set parameters for a file that is not empty, the user needs search access to all ancestors, except the parent directory, as well as write access to the parent directory. To set parameters for an empty file, the user needs search or write access to all ancestors, except the parent directory, as well as write access to the parent directory.

For files, call `FPSetFileParms` to set parameters and attributes that `FPSetFileDirParms` cannot set. For directories, call `FPSetDirParms` to set parameters and attributes that `FPSetFileDirParms` cannot set.

Table 69 lists the result codes for the `FPSetFileDirParms` command.

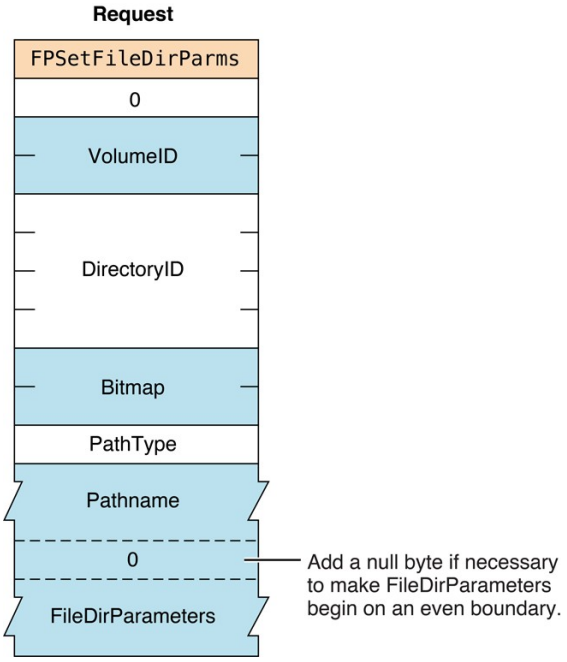
Table 69 Result codes for the `FPSetFileDirParms` command

Result code	Explanation
`kFPAccessDenied`	User does not have the access privileges required to use this command.

kFPBitmapErr	Attempt was made to set a parameter that cannot be set by this command; bitmap is null.
kFPMiscErr	Non-AFP error occurred.
kFPObjectNotFound	Input parameters do not point to an existing file or directory.
kFPParamErr	Session reference number, Volume ID, or pathname type is unknown; pathname is invalid.
kFPVolLocked	Volume is ReadOnly.

Figure 75 shows the request block for the FPSetFileDirParms command.

Figure 75 Request block for the FPSetFileDirParms command



FPSetFileParms

Sets parameters for a file.

```
uint8_t CommandCode
uint8_t Pad
int16_t VolumeID
int32_t DirectoryID
int16_t Bitmap
uint8_t PathType
string Pathname
FileParameters
```

Parameters

CommandCode

kFPSetFileParms (30).

Pad

Pad byte.

VolumeID

Volume ID.

DirectoryID
Ancestor Directory ID.

Bitmap
Bitmap describing the parameters to set. Set the bit that corresponds to each desired parameter. This bitmap can be the same as the FileBitmap parameter of the `FPGetFileDirParms` command. For bit definitions for this bitmap, see "File and Directory Bitmap."

PathType
Type of name in `Pathname`. See "Path Type Constants" for possible values.

Pathname
Pathname to the desired file or directory. `Pathname` is a string if it contains Short or Long Names or an AFPName if it contains a UTF-8–encoded path. See the Character Encoding section of "Apple Filing Protocol Concepts" in *Apple Filing Protocol Programming Guide* for additional details about the UTF-8 encoding used by AFP.

FileParameters
Parameters to be set, packed in bitmap order.

Result
`kFPNoErr` if no error occurred. See Table 70 for the possible result codes.

ReplyBlock
None.

Discussion
The parameters must be packed, in bitmap order, in the request block. Variable-length parameters must be kept at the end of the block. To do this, variable-length parameters are represented in bitmap order as fixed-length offsets (integers). These offsets are measured from the start of the parameters to the start of the variable-length parameters. The actual variable-length parameters are then packed after all fixed-length parameters.

If necessary, a null byte must be added between `Pathname` and `FileParameters` in the request block to make `FileParameters` begin on an even boundary.

The following parameters may be set or cleared: Attributes (all attributes except `DAlreadyOpen`, `RAlreadyOpen`, and `CopyProtect`), Creation Date, Modification Date, Backup Date, Finder Info, and UNIX privileges.

If the Attributes parameter is included, the Set/Clear bit indicates that the specified attributes are to be set (1) or cleared (0). Therefore, it is not possible to set some attributes and clear other attributes in the same call.

If this command changes the file's Invisible attribute, the modification date of the file's parent directory is set to the server's clock. If this command changes the file's Attributes or sets any dates (except modification date), or Finder Info, the file's modification date is set to the server's clock.

If the file is empty (both forks are zero length), the user must have search or write access to all ancestors, except this file's parent directory, as well as write access to the parent directory. If either fork is not empty, the user must have search access to all ancestors except the parent directory, as well as read and write access to the parent directory.

This command cannot be used to set a file's name; instead, use `FPRename`. This command cannot be used to set the file's Parent Directory ID; instead, use `FPMoveAndRename`. This command cannot be used to set a file's fork lengths; instead, call `FPSetForkParms`. This command cannot be used to set a file's Node ID.

Table 70 lists the result codes for the `FPSetFileParms` command.

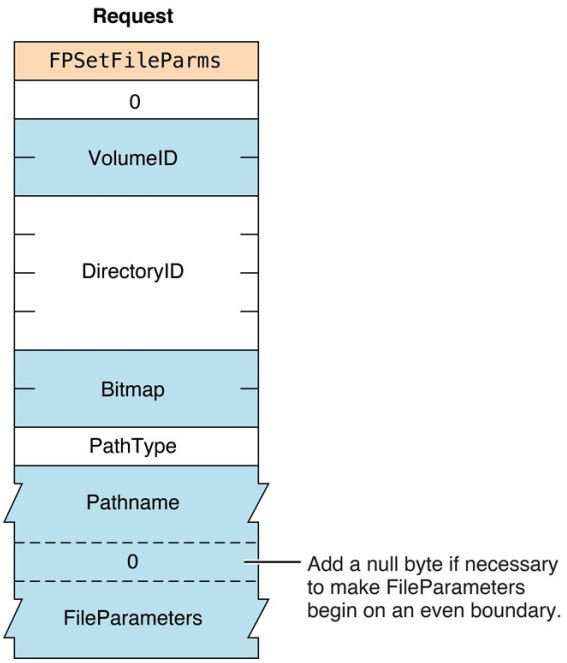
Table 70 Result codes for the `FPSetFileParms` command

Result code	Explanation
`kFPAccessDenied`	User does not have the access privileges required to use this command.
`kFPBitmapErr`	Attempt was made to set a parameter that cannot be set by this command; bitmap is null.

`kFPMiscErr`	Non-AFP error occurred.
`kFPObjectNotFound`	Input parameters do not point to an existing file.
`kFPObjectTypeErr`	Input parameters point to a directory.
`kFPParamErr`	Session reference number, Volume ID, or pathname type is unknown; pathname is invalid or null.

Figure 76 shows the request block for the `FPSetFileParms` command.

Figure 76 Request block for the `FPSetFileParms` command



FPSetForkParms

Sets the length of a fork.

```
uint8_t CommandCode
uint8_t Pad
int16_t OForkRefNum
int16_t Bitmap
int32_t or int64_t ForkLen
```

Parameters

CommandCode

`kFPSetForkParms` (31).

Pad

Pad byte.

OForkRefNum

Open fork reference number.

Bitmap

Bitmap describing the parameters to set. Set the bit that corresponds to each desired parameter. This bitmap is the

same as the FileBitmap of the FPGetFileDirParms command, but only the Data Fork Length, Resource Fork Length, Extended Data Fork Length, and Extended Resource Fork Length parameters can be set. For bit definitions for this bitmap, see "File and Directory Bitmap."

ForkLen
New end-of-fork value. This value is either 32 bits or 64 bits in length, depending on whether you are setting the length or extended length parameter.

Result
kFPNoErr if no error occurred. See Table 71 for the possible result codes.

ReplyBlock
None.

Discussion

The Bitmap and ForkLen parameters are passed to the server, which changes the length of the fork specified by OForkRefNum. The server returns a kFPBitmapErr result code if the command tries to set the length of the file's other fork or if it tries to set any other file parameter.

The server returns a kFPLockErr result code if an attempt is made to truncate the fork in a way that would eliminate a range or part of a range that is locked by another user.

The fork must be open for writing by the user.

This command cannot set a file's name; instead, use FPRename. This command cannot set a file's Parent Directory ID; instead, use FPMoveAndRename. This command cannot set a file's file number.

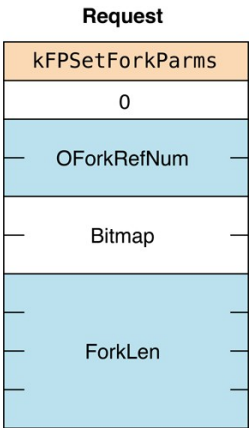
Table 71 lists the result codes for the FPSetForkParms command.

Table 71 Result codes for the FPSetForkParms command

Result code	Explanation
kFPAccessDenied	User does not have the access privileges required to use this command.
kFPBitmapErr	Attempt was made to set a parameter that cannot be set by this command; bitmap is null.
kFPDiskFull	No more space exists on the volume.
kFPLockErr	Range lock conflict exists.
kFPMiscErr	Non-AFP error occurred.
kFPParamErr	Session reference number or fork reference number is invalid.
kFPVolLocked	Volume is ReadOnly.

Figure 77 shows the request block for the FPSetForkParms command.

Figure 77 Request block for the FPSetForkParms command



FPSetVolParms

Sets a volume's backup date.

```
uint8_t CommandCode
uint8_t Pad
int16_t VolumeID
int16_t Bitmap
Date BackupDate
```

Parameters

CommandCode

`kFPSetVolParms` (32).

Pad

Pad byte.

VolumeID

Volume ID.

Bitmap

Bitmap describing the parameters to be set. This parameter is the same as the `Bitmap` parameter for the `FPGetVolParms` command, but only the Backup Date bit can be set. For bit definitions for this bitmap, see "Volume Bitmap."

BackupDate

New backup date.

Result

`kFPNoErr` if no error occurred. See Table 72 for the possible result codes.

ReplyBlock

None.

Discussion

This command sets a volume's backup date.

Table 72 lists the result codes for the `FPSetVolParms` command.

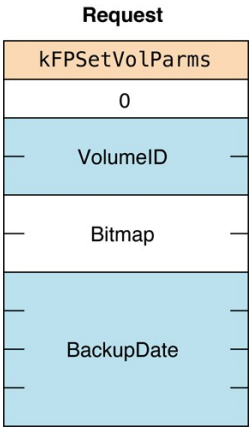
Table 72 Result codes for the `FPSetVolParms` command

Result code	Explanation
`kFPAccessDenied`	User does not have the access privileges required to use this command.
`kFPBitmapErr`	Attempt was made to set a parameter that cannot be set by this command; bitmap is null.

`kFPMiscErr`	Non-AFP error occurred.
`kFPParamErr`	Session reference number is unknown.
`kFPVolLocked`	Volume is ReadOnly.

Figure 78 shows the request block for the `FPSetVolParms` command.

Figure 78 Request block for the `FPSetVolParms` command



FPSpotlightRPC

Spotlight RPC command.

Discussion

This command (command code 76) is a private command used by Spotlight searching on the AFP server. This command is not documented.

FPSyncDir

Force changes to a directory to be flushed to disk.

```
uint8_t funcCode;
uint8_t pad;
int16_t volID;
int32_t dirID;
```

Parameters

funcCode

`kFPSyncDir` (78)

pad

Alignment pad.

volID

The volume ID of the volume containing the directory to flush.

dirID

The directory ID to flush.

Return Value

The reply block indicates whether the call succeeded or not. It can return `kFPNoErr` (success), `kFPObjectNotFound` (invalid `volID` for sharepoint or directory is not inside that sharepoint), `kFPParamErr` (invalid `dirID` specified), or `kFPAccessDenied` (insufficient permissions).

Discussion

FPSyncDir commits to stable storage any data and metadata associated with files and directories contained in the hierarchy rooted at the directory specified.

A successful reply to this command indicates that prior changes are durable (as in the "D" of ACID semantics). This call is required to support Time Machine over AFP.

FPSyncFork

Force changes to a file to be flushed to disk.

```
uint8_t funcCode;
uint8_t pad;
int16_t forkRefNum;
```

Parameters

funcCode

`kFPSyncFork` (79)

pad

Alignment pad.

forkRefNum

The reference number of the open fork to flush.

Return Value

The reply block indicates whether the call succeeded or not. It can return `kFPNoErr` (success), `kFPObjectNotFound` (invalid sharepoint volume ID or file is not inside that sharepoint), `kFPParamErr` (invalid `forkRefNum` specified or too many forks open), or `kFPAccessDenied` (insufficient permissions).

Discussion

FPSyncFork should ensures that all prior writes to the specified fork (including file metadata) are complete and written to stable storage.

A successful reply to this command indicates that prior changes are durable (as in the "D" of ACID semantics). This call is required to support Time Machine over AFP.

FPWrite

Writes a block of data to an open fork.

```
uint8_t CommandCode
uint8_t Flag
int16_t OForkRefNum
int32_t Offset
int32_t ReqCount
ForkData
```

Parameters

CommandCode

`kFPWrite` (33).

Flag

Bit 7 is the `StartEndFlag` bit, and it indicates whether `Offset` is relative to the beginning or end of the fork. A value of zero indicates that the start is relative to the beginning of the fork; a value of 1 indicates that the start is relative to the end of the fork.

OForkRefNum
Open fork reference number.

Offset
Byte offset from the beginning or the end of the fork indicating where the write is to begin; a negative value indicates a byte within the fork relative to the end of the fork.

ReqCount
Number of bytes to be written.

ForkData
Data to be written.

As a historical footnote, in legacy ASP (non-TCP) versions, this field was not a part of the request block. Instead, the data was transmitted to the server in an intermediate exchange of ASP packets.

Result
`kFPNoErr` if no error occurred. See Table 73 for the possible result codes.

ReplyBlock
If the result code is `kFPNoErr`, the server returns a reply block consisting of an int32_t, called `LastWritten`, containing the number of the byte just past the last byte written.

Discussion

The server writes data to the open fork, starting at the number of bytes from the beginning or end of the fork as specified by `Offset`. The `StartEndFlag` bit indicates whether the block of data is to be written at an offset relative to the beginning or the end of the fork. When the offset is relative to the end of the fork, data can be written without knowing the exact end of the fork, which is useful when multiple writers modify a fork concurrently. The server returns the number of the byte just past the last byte written.

This command differs from the `FPWriteExt` command in that the `FPWriteExt` command is prepared to handle the large values that may be required for writing to files that reside in volumes larger than 4 GB in size.

If the block of data to be written extends beyond the end of the fork, the fork is extended. If part of the range is locked by another user, the server returns a `kFPLockErr` result code and does not write any data to the fork.

The file's Modification Date is not changed until the fork is closed.

The fork must be open for writing by the user sending this command.

Lock the range before sending this command. The underlying transport mechanism may force the request to be broken into multiple smaller requests. If the range is not locked when this command begins execution, it is possible for another user to lock some or all of the range before this command completes, causing the write to succeed partially.

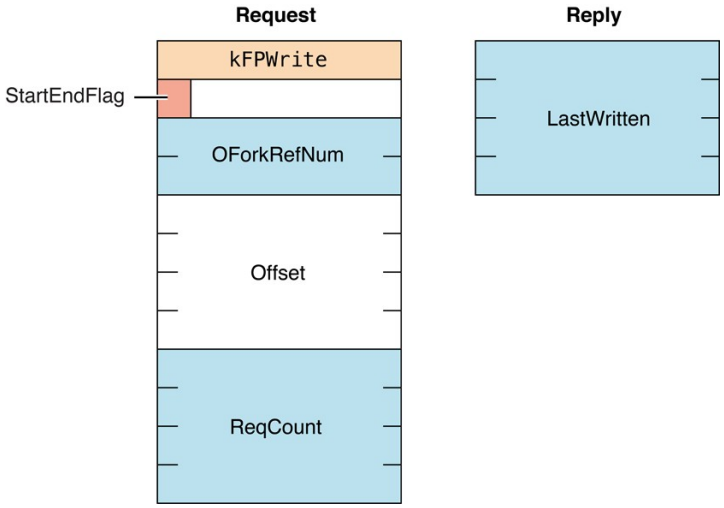
Table 73 lists the result codes for the `FPWrite` command.

Table 73 Result codes for the `FPWrite` command

Result code	Explanation
`kFPAccessDenied`	Fork is not open for writing by this user.
`kFPDiskFull`	No space exists on the volume.
`kFPLockErr`	Some or all of the requested range is locked by another user.
`kFPMiscErr`	Non-AFP error occurred.
`kFPParamErr`	Session reference number or open fork reference number is unknown.

Figure 79 shows the request and reply blocks for the `FPWrite` command.

Figure 79 Request and reply blocks for the `FPWrite` command



Availability

Deprecated. Use `FPWriteExt` instead.

FPWriteExt

Writes a block of data to an open fork.

```
uint8_t CommandCode
uint8_t Flag
int16_t OForkRefNum
int64_t Offset
int64_t ReqCount
ForkData
```

Parameters

CommandCode

`kFPWriteExt` (61).

Flag

Bit 7 of the `Flag` parameter is the `StartEndFlag` bit, and it indicates whether `Offset` is relative to the beginning or end of the fork. A value of zero indicates that the start is relative to the beginning of the fork; a value of 1 indicates that the start is relative to the end of the fork.

OForkRefNum

Open fork reference number.

Offset

Byte offset from the beginning or the end of the fork indicating where the write is to begin; a negative value indicates a byte within the fork relative to the end of the fork.

ReqCount

Number of bytes to be written.

ForkData

Data to be written.

As a historical footnote, in legacy ASP (non-TCP) versions, this field was not a part of the request block. Instead, the data was transmitted to the server in an intermediate exchange of ASP packets.

Result

`kFPNoErr` if no error occurred. See Table 74for the possible result codes.

ReplyBlock

If the result code is `kFPNoErr`, the server returns a reply block consisting of an int32_t, called `LastWritten`, containing the number of the byte just past the last byte written.

Discussion

The server writes data to the open fork, starting at the number of bytes from the beginning or end of the fork as specified by `Offset`.

This command differs from the `FPWrite` command in that this command is prepared to handle the large values that may be required for writing to files that reside in volumes larger than 4 GB in size.

The `StartEndFlag` bit indicates whether the block of data is to be written at an offset relative to the beginning or the end of the fork. When the offset is relative to the end of the fork, data can be written without knowing the exact end of the fork, which is useful when multiple writers modify a fork concurrently. The server returns the number of the byte just past the last byte written.

If the block of data to be written extends beyond the end of the fork, the fork is extended. If part of the range is locked by another user, the server returns a `kFPLockErr` result code and does not write any data to the fork.

The file's Modification Date is not changed until the fork is closed.

The fork must be open for writing by the user sending this command.

Lock the range before sending this command. The underlying transport mechanism may force the request to be broken into multiple smaller requests. If the range is not locked when this command begins execution, it is possible for another user to lock some or all of the range before this command completes, causing the write to success partially.

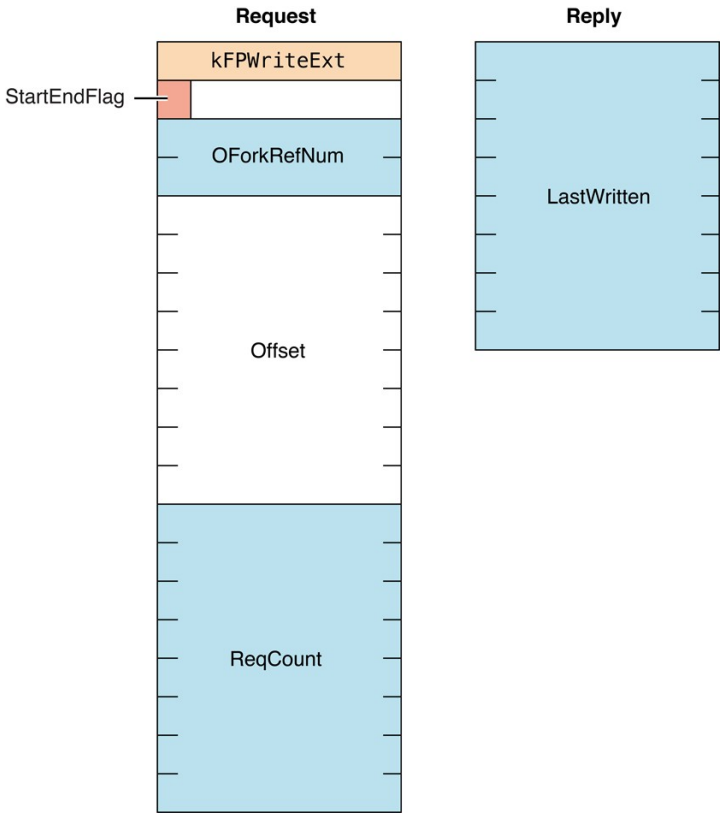
Table 74 lists the result codes for the `FPWriteExt` command.

Table 74 Result codes for the `FPWriteExt` command

Result code	Explanation
`kFPAccessDenied`	Fork is not open for writing by this user.
`kFPDiskFull`	No space exists on the volume.
`kFPLockErr`	Some or all of the requested range is locked by another user.
`kFPMiscErr`	Non-AFP error occurred.
`kFPParamErr`	Session reference number or open fork reference number is unknown.

Figure 80 shows the request and reply blocks for the `FPWriteExt` command.

Figure 80 Request and reply blocks for the `FPWriteExt` command



FPZzzzz

Notifies the server that the client is going to sleep.

```
uint8_t CommandCode
uint8_t Pad
uint32_t Flags
```

Parameters

CommandCode

`kFPZzzzz` (122).

Flags

Reserved.

ReplyBlock

None.

Discussion

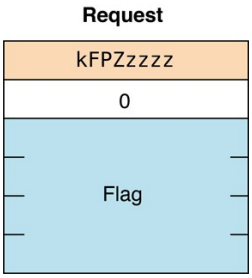
If an AFP sharepoint is mounted when the client goes to sleep (for example, an idle sleep or a demand sleep such as when the lid of a PowerBook is closed), the client sends the `FPZzzzz` command. This command notifies the AFP server that the client is going to sleep and that the server should not send any more packets to the client. When the client is awakens, it will send AFP packets to the server, which notifies the server that the client is now awake.

The AFP server should have a setting for the maximum time that a client can sleep — typically 24 hours. If a client has been asleep longer than the maximum sleep time, the server assumes that the client has been disconnected and may free client-related resources on the server.

The `FPZzzzz` command is supported by AFP 2.3 and later over AFP/TCP only.

Figure 81 shows the request block for the `FPZzzzz` command.

Figure 81 Request block for the `FPZzzzz` command



If the server supports extended sleep information (kSupportsExtSleep in server flags bitmap—see "Server Flags Bitmap"), then before the client goes to sleep, it sends the *FPZzzzz* command with the `Flag` field set to `1`. When the server receives this command with `Flag` set to `1`, it should disable its tickle timers and tickle monitoring.

> **Important:** This message indicates that the client is about to go to sleep. However, more AFP packets may be sent after this message. Such packets do not indicate that the client woke up; in many cases the client is still preparing to go to sleep.

When the client wakes up, it sends another `FPZzzzz` command, this time with the `Flag` field set to `2`. This indicates to the server that the client is now awake. When the server receives this sleep command with `Flag` set to `2`, it should reenable its tickle timers and tickle monitoring.

Data Types

AFP Protocol Data Types

FPUnixPrivs

A structure the describes UNIX privileges for files and directories that reside on a volume that supports UNIX privileges.

```
struct FPUnixPrivs {
   uint32_t uid;
   uint32_t gid;
   uint32_t permissions;
   uint32_t ua_permissions;
};
```

Fields

`uid`
User ID of the file or directory's owner.

`gid`
Group ID of the file or directory's owner.

`permissions`
The complete set of file or directory permission bits, including execute bits. This bitmap is used when the client is changing the permissions on the server. (It can also be used to detect symbolic links by using the `S_IFMT` bits described in `<sys/stat.h>`.)

`ua_permissions`
User's access rights to the file or directory. This bitmap is in the same format as the AFP access rights. See "Access Rights Bitmap" for more information.

Discussion

A `FPUnixPrivs` structure is returned when you call `FPGetFileDirParms` and specify that you want to get the UNIX privileges for a file or directory.

> **Note:** If `kFPUnixPrivsBit` is set for a volume, UNIX privileges must be supported for *both* directories and files.

Access Control List Structure

Structure that describes a file or directory's access control list (ACL).

```
struct kauth_acl {
   u_int32_t acl_entrycount;
   u_int32_t acl_flags;
   struct kauth_ace acl_ace[];
};
```

Fields

`acl_entrycount`
Number of `acl_ace` structures.

`acl_flags`
See the Core Foundation ACL documentation for definitions.

`acl_ace`
An `acl_ace` structure. See the Core Foundation ACL documentation for a description of this structure.

Discussion

The Access Control List structure is returned by the `FPGetACL` command and set by the `FPSetACL` command.

DSI Transport Layer Data Types

DSIHeader

The DSI prepends the DSI header shown in Figure 82 to every AFP request and reply packet.

```
struct {
   uint8_t flags;
   uint8_t command;
   uint16_t requestID;
   union {
      uint32_t errorCode;
      uint32_t writeOffset;
   };
   uint32_t totalDataLength;
   uint32_t reserved;
};
```

Fields

`flags`
An 8-bit value that allows an AFP server to determine the packet type. The following packet types are defined:

`0x00` = request
`0x01` = reply

`command`
An 8-bit value containing a value that represents a DSI command.

`requestID`
A 16-bit value containing a request ID on a per connection (session) basis. A request ID is generated by the host that issued the request. In reply packets, the request ID is used to locate the corresponding request.

Request IDs must be generated in sequential order and can be from `0` to `65535` in value. The request ID after `65535`

wraps to `0`. The client generates the initial request ID and sends it to the server in a `DSIOpenSession` command. The server uses the following algorithm to anticipate the client's next request ID:

```
if (LastReqID == 65536) LastReqID = 0;
else LastReqID = LastReqID + 1;
ExpectedReqID = LastReqID;
```

Servers begin generating request IDs at zero (`0`).

`writeOffset`

In request packets, this field is ignored by the server for all commands except `DSIWrite`. For future compatibility, clients should set this field to zero for all commands except `DSIWrite`.

In request packets in which the command is `DSIWrite`, this field contains a data offset that is the number of bytes in the packet representing AFP command information. The server uses this information to collect the AFP command part of the packet before it accepts the actual data to write.

For example, when a client sends an `FPWrite` command to write data on the server, the enclosed data offset should be `12`.

`errorCode`

In reply packets, this field contains an error code.

`totalDataLength`

A 32-bit unsigned value that specifies the total length of the data that follows the DSI header.

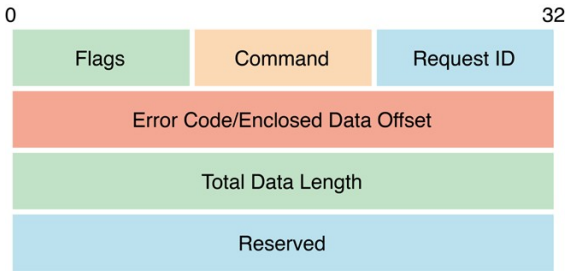
`reserved`

A 32-bit field reserved for future use. Clients should set this field to zero.

Discussion

Figure 82 gives a visual representation of the header format.

Figure 82 DSI header format



Constants

AFP Protocol Constants

Access Control List Bitmap

Bitmap for getting and setting access control lists (ACLs).

```
enum {
kFileSec_UUID = 0x01,
kFileSec_GRPUUID = 0x02,
kFileSec_ACL = 0x04,
kFileSec_REMOVEACL = 0x08,
kFileSec_Inherit = 0x10
};
```

Constants

`kFileSec_UUID`
Set this bit to get or set a UUID.

`kFileSec_GRPUUID`
Set this bit to get or set a Group UUID.

`kFileSec_ACL`
Set this bit to get or set an ACL.

`kFileSec_REMOVEACL`
Set this bit to remove an ACL. This bit is not valid when used with the `FPGetACL`.

`kFileSec_Inherit`
Set this bit on any access control entries (ACEs) that have already been inherited. This constant is used only with the `FPSetACL` command.

Discussion

Use the Access Control List bitmap with the `FPGetACL` and `FPSetACL` commands to control the behavior of those commands.

AFP Version Strings

Strings that identify different AFP versions.

```
#define kAFPVersion_2_1 "AFPVersion 2.1"
#define kAFPVersion_2_2 "AFP2.2"
#define kAFPVersion_2_3 "AFP2.3"
#define kAFPVersion_3_0 "AFPX03"
#define kAFPVersion_3_1 "AFP3.1"
#define kAFPVersion_3_2 "AFP3.2"
#define kAFPVersion_3_3 "AFP3.3"
```

Constants

`kAFPVersion_2_1`
AFP version 2.1.

`kAFPVersion_2_2`
AFP version 2.2.

`kAFPVersion_2_3`
AFP version 2.3. Indicates support for `FPZzzzz` command.

`kAFPVersion_3_0`
AFP version 3.0. OS X v.10.0 and 10.1.

`kAFPVersion_3_1`
AFP version 3.1. OS X v.10.2 and 10.3.

`kAFPVersion_3_2`
AFP version 3.2. OS X v.10.4 and 10.5.

`kAFPVersion_3_3`
AFP version 3.3. Indicates support for the replay cache on the server and support for `FPSyncDir` and `FPSyncFork`.

Discussion

AFP Version strings are returned by the `FPGetSrvrInfo` command. AFP clients sent an AFP Version string as a parameter to the `FPLogin` and `FPLoginExt` commands.

AFP UAM Strings

Strings that identify different UAM versions.

```
#define kNoUserAuthStr "No User Authent"
#define kClearTextUAMStr "Cleartxt Passwrd"
```

```
#define kRandNumUAMStr "Randnum Exchange"
#define kTwoWayRandNumUAMStr "2-Way Randnum"
#define kDHCAST128UAMStr "DHCAST128"
#define kDHX2UAMStr "DHX2"
#define kKerberosUAMStr "Client Krb v2"
#define kReconnectUAMStr "Recon1"
```

Constants

`kNoUserAuthStr`
UAM that does not require user authentication.

`kClearTextPwdStr`
Cleartext Password UAM.

`kRandNumUAMStr`
Random Number Exchange UAM. (**Deprecated.** Obsolete. No longer supported in OS X.)

`kTwoWayRandNumUAMStr`
Two-Way Random Number Exchange UAM.

`kDHCAST128UAMStr`
Diffie-Hellman Exchange UAM.

`kDHX2UAMStr`
Diffie-Hellman Exchange 2 UAM.

`kKerberosUAMStr`
Kerberos UAM.

`kReconnectUAMStr`
Reconnect UAM.

Discussion

AFP UAM strings are returned by the `FPGetSrvrInfo` command. AFP clients sent an AFP UAM string as a parameter to the `FPLogin` and `FPLoginExt` commands.

FPGetSessionToken Types

Values for the `Type` parameter of the `FPGetSessionToken` command.

```
enum {
   kLoginWithoutID = 0,
   kLoginWithID = 1,
   kReconnWithID = 2,
   kLoginWithTimeAndID = 3,
   kReconnWithTimeAndID = 4,
   kRecon1Login = 5,
   kRecon1ReconnectLogin = 6,
   kRecon1RefreshToken = 7,
   kGetKerberosSessionKey = 8
};
```

Constants

`kLoginWithoutID`
The `FPGetSessionToken` parameter block does not contain an `ID` parameter; specified by AFP clients that support a version of AFP prior to AFP 3.1.

`kLoginWithID`
Deprecated. Use `kLoginWithTimeAndID` instead.

`kReconnWithID`
Deprecated. Use `kReconnWithTimeAndID` instead.

`kLoginWithTimeAndID`
The `FPGetSessionToken` parameter block contains an `ID` and a time stamp parameter. The command is sent to indicate that the client wants its old session to be discarded.

`kReconnWithTimeAndID`
The `FPGetSessionToken` parameter block contains an `ID` and a time stamp parameter. The command is sent to indicate that the client has successfully reconnected and wants the session to be updated with the new value of `ID`.

`kRecon1Login`
Used after logging in to get a credential that can be used to reconnect using the Reconnect UAM. Specifying `kRecon1Login` tells the server to destroy any old sessions that may be associated with the `ID` parameter to the `FPGetSessionToken` command.

`kRecon1ReconnectLogin`
Used to get a new reconnect token after reconnecting using the Reconnect UAM.

`kRecon1RefreshToken`
Used to get a new credential when the current credential is about to expire.

`kGetKerberosSessionKey`
Used to get a Kerberos v5 session key.

Discussion

The value of the `Type` parameter determines the behavior of the server when it receives the`FPGetSessionToken` command.

FPGetSrvrMsg Bitmap

Values used for the MessageBitmap parameter of the `FPGetSrvrMsg` command.

```
kSrvrMsg = 0x1
kUTF8SrvrMsg = 0x2
```

Constants

`kSrvrMsg`
Indicates that `ServerMessage` field contains a server message. (If this bit is clear, the `ServerMessage` field contains a login message.)

`kUTF8SrvrMsg`
Indicates that `ServerMessage` field is in UTF-8 encoding. Introduced in AFP 3.0. See the Character Encoding section of “Apple Filing Protocol Concepts” in *Apple Filing Protocol Programming Guide* for additional details about the UTF-8 encoding used by AFP.

FPMapID Constants

Values used in the `Subfunction` parameter of the `FPMapID` command.

```
enum {
kUserIDToName = 1,
kGroupIDToName = 2,
kUserIDToUTF8Name = 3,
kGroupIDToUTF8Name = 4,
kUserUUIDToUTF8Name = 5,
kGroupUUIDToUTF8Name = 6
};
```

Constants

`kUserIDToName`
Causes `FPMapID` to map the specified User ID to its respective Macintosh Roman user name.

`kGroupIDToName`
Causes `FPMapID` to map the specified Group ID to its respective Macintosh Roman group name.

`kUserIDToUTF8Name`
Causes `FPMapID` to map the specified User ID to its respective user name in UTF-8 encoding.

`kGroupIDToUTF8Name`
Causes `FPMapID` to map the specified Group ID to its respective group name in UTF-8 encoding.

`kUserUUIDToUTF8Name`
Causes `FPMapID` to map the specified User UUID to its respective user name in UTF-8 encoding.

`kGroupUUIDToUTF8Name`
Causes `FPMapID` to map the specified Group UUID to its respective group name in UTF-8 encoding.

Discussion

These constants are used with the `FPMapID` command to indicate the way in which mapping is to occur. See the Character Encoding section of "Apple Filing Protocol Concepts" in *Apple Filing Protocol Programming Guide* for additional details about the UTF-8 encoding used by AFP.

FPMapName Constants

Values used in the `Subfunction` parameter of the `FPMapID` command.

```
enum {
kNameToUserID = 1,
kNameToGroupID = 2,
kUTF8NameToUserID = 3,
kUTF8NameToGroupID = 4,
kUTF8NameToUserUUID = 5,
kUTF8NameToGroupUUID = 6
};
```

Constants

`kNameToUserID`
Causes `FPMapName` to map the specified Macintosh Roman user name to its respective User ID.

`kNameToGroupID`
Causes `FPMapName` to map the specified Macintosh Roman Group name to its respective Group ID.

`kUTF8NameToUserID`
Causes `FPMapName` to map the specified UTF-8-encoded user name to its respective User ID.

`kUTF8NameToGroupID`
Causes `FPMapName` to map the specified UTF-8-encoded group name to its respective Group ID.

`kUTF8NameToUserUUID`
Causes `FPMapName` to map the specified UTF-8-encoded user name to its respective user UUID.

`kUTF8NameToGroupUUID`
Causes `FPMapName` to map the specified UTF-8-encoded user name to its respective Group UUID.

Discussion

These constants are used with the `FPMapName` command to indicate the way in which mapping is to occur. See the Character Encoding section of "Apple Filing Protocol Concepts" in *Apple Filing Protocol Programming Guide* for additional details about the UTF-8 encoding used by AFP.

Path Type Constants

Constants indicating the type of names in a `Pathname` parameter

```
enum {
kFPShortName = 1,
kFPLongName = 2,
kFPUTF8Name = 3
};
```

Constants

`kFPShortName`
Indicates that a `Pathname` parameter contains Short Names.

`kFPLongName`
Indicates that a `Pathname` parameter contains Long Names.

`kFPUTF8Name`
Indicates that a `Pathname` parameter contains an AFPName, which consists of a four-byte text encoding hint followed a two-byte length, followed by a UTF-8-encoded pathname.

Discussion

These constants are used in the `PathType` parameter for many AFP commands to specify the type of names that appear in an associated `Pathname` parameter. See the Character Encoding section of "Apple Filing Protocol Concepts" in *Apple Filing Protocol Programming Guide* for additional details about the UTF-8 encoding used by AFP.

File Creation Constants

Constants used when creating files.

```
enum {
kFPSoftCreate = 0,
kFPHardCreate = 0x80
};
```

Constants

`kFPSoftCreate`
Indicates soft creation.

`kFPLongCreate`
Indicates indicates hard creation.

Discussion

These constants are used in the `Flag` parameter for the `FPCreateFile` command.

ACL Access Rights

Access rights bit definitions.

```
    #define KAUTH_VNODE_READ_DATA             (1<<1)
    #define KAUTH_VNODE_LIST_DIRECTORY        KAUTH_VNODE_READ_DATA
    #define KAUTH_VNODE_WRITE_DATA            (1<<2)
    #define KAUTH_VNODE_ADD_FILE              KAUTH_VNODE_WRITE_DATA
    #define KAUTH_VNODE_EXECUTE               (1<<3)
    #define KAUTH_VNODE_SEARCH                KAUTH_VNODE_EXECUTE
    #define KAUTH_VNODE_DELETE                (1<<4)
    #define KAUTH_VNODE_APPEND_DATA           (1<<5)
    #define KAUTH_VNODE_ADD_SUBDIRECTORY      KAUTH_VNODE_APPEND_DATA
    #define KAUTH_VNODE_DELETE_CHILD          (1<<6)
    #define KAUTH_VNODE_READ_ATTRIBUTES       (1<<7)
    #define KAUTH_VNODE_WRITE_ATTRIBUTES      (1<<8)
    #define KAUTH_VNODE_READ_EXTATTRIBUTES    (1<<9)
    #define KAUTH_VNODE_WRITE_EXTATTRIBUTES   (1<<10)
    #define KAUTH_VNODE_READ_SECURITY         (1<<11)
    #define KAUTH_VNODE_WRITE_SECURITY        (1<<12)
    #define KAUTH_VNODE_CHANGE_OWNER          (1<<13)
    #define KAUTH_VNODE_SYNCHRONIZE           (1<<20)
    #define KAUTH_VNODE_GENERIC_ALL           (1<<21)
    #define KAUTH_VNODE_GENERIC_EXECUTE       (1<<22)
    #define KAUTH_VNODE_GENERIC_WRITE         (1<<23)
    #define KAUTH_VNODE_GENERIC_READ          (1<<24)
```

Constants

`KAUTH_VNODE_READ_DATA`
For a file, the right to read a file's data; for a directory, the right to list the contents of a directory.

`KAUTH_VNODE_LIST_DIRECTORY`
For a directory, the same as `KAUTH_VNODE_LIST_DIRECTORY`, which is the right to list the contents of a directory.

`KAUTH_VNODE_WRITE_DATA`
For a file, the right to write to a file; for a directory, the right to create a file in a directory.

`KAUTH_VNODE_ADD_FILE`
For a file, the same as `KAUTH_VNODE_WRITE_DATA`; the right to write to a file.

`KAUTH_VNODE_EXECUTE`
Right to execute a program.

`KAUTH_VNODE_SEARCH`
Same as `KAUTH_VNODE_EXECUTE`.

`KAUTH_VNODE_DELETE`
Right to delete a file.

`KAUTH_VNODE_APPEND_DATA`
For a file, the right to append data to a file; for a directory, the right to create a subdirectory in a directory.

`KAUTH_VNODE_ADD_SUBDIRECTORY`
For a directory, the same as `kAUTH_VNODE_APPEND_DATA`, which is the right to create a subdirectory in a directory.

`KAUTH_VNODE_DELETE_CHILD`
Right to delete a directory and all the files it contains.

`KAUTH_VNODE_READ_ATTRIBUTES`
Right to read a file's hidden attributes, such as hidden, read-only, system, and archive.

`KAUTH_VNODE_WRITE_ATTRIBUTES`
Right to write a file's attributes, such as hidden, read-only, system, and archive.

`KAUTH_VNODE_READ_EXTATTRIBUTES`
Right to read a file or directory's extended attributes.

`KAUTH_VNODE_WRITE_EXTATTRIBUTES`
Right to write extended attributes.

`KAUTH_VNODE_READ_SECURITY`
Right to get a file or directory's access rights.

`KAUTH_VNODE_WRITE_SECURITY`
Right to set a file or directory's access rights.

`KAUTH_VNODE_CHANGE_OWNER`
Right to change the owner of a file or directory.

`KAUTH_VNODE_SYNCHRONIZE`
Right to block until the file or directory is put in the signaled state; provided for Windows interoperability.

`KAUTH_VNODE_GENERIC_ALL`
Windows NT right that includes all rights specified by `KAUTH_VNODE_GENERIC_EXECUTE`, `KAUTH_VNODE_GENERIC_WRITE`, and `KAUTH_VNODE_GENERIC_READ`.

`KAUTH_VNODE_GENERIC_EXECUTE`
Windows NT right that in Windows 2000 became the right to read attributes, read permissions, traverse folders, and execute files.

`KAUTH_VNODE_GENERIC_WRITE`
Windows NT right that in Windows 2000 became right to read access rights, create a subdirectory in a directory, write data in a file, create files in a directory, append data to a file, write attributes, and write extended attributes.

`KAUTH_VNODE_GENERIC_READ`
Windows NT right that in Windows 2000 became right to list directories, read file data, read attributes, read extended attributes, and read access rights.

Discussion

These definitions are made in `kauth.h`. Use these definitions to specify access rights when calling `FPAccess`, to parse the access rights returned by `FPGetACL`, and to set access rights when calling `FPSetExtAttr`.

Access Rights Bitmap

A 32-bit value whose bits indicate the ability of the directory's Owner, Group, and Everyone to read, write, and search a

directory.

```
enum {
   kSPOwner =             0x1,
   kRPOwner =             0x2,
   kWROwner =             0x4,

   kSPGroup =           0x100,
   kRPGroup =           0x200,
   kWRGroup =           0x400,

   kSPOther =         0x10000,
   kRPOther =         0x20000,
   kWROther =         0x40000,

   kSPUser =        0x1000000,
   kRPUser =        0x2000000,
   kWRUser =        0x4000000,
   kBlankAcess =  0x10000000,
   kUserIsOwner = 0x80000000
};
```

Constants

`kSPOwner`
Originally stood for search permission. In OS X, this bit is used for execute permission for the owner.

`kRPOwner`
Read permission for the owner.

`kWPOwner`
Write permission for the owner.

`kSPGroup`
Originally stood for search permission. In OS X, this bit is used for execute permission for the owning group.

`kRPGroup`
Read permission for the owning group.

`kWPGroup`
Write permission for the owning group.

`kSPOther`
Originally stood for search permission. In OS X, this bit is used for execute permission for users who are neither the owner nor in the owning group.

`kRPOther`
Read permission for users who are neither the owner nor in the owning group.

`kWPOther`
Write permission for users who are neither the owner nor in the owning group.

`kSPUser`
Originally stood for search permission. In OS X, this bit is used for execute permission for the currently logged in user.

`kRPUser`
Read permission for the currently logged in user.

`kWPUser`
Write permission for the currently logged in user.

`kBlankAcess`
When the blank access privileges bit is set for a directory, its other access privilege bits are ignored, and the access privilege bits of the directory's parent apply to the directory, including the parent's group affiliation.

> **Note:** Inherited access privileges are deprecated and are replaced by `kDefaultPrivsFromParent` in the `FPGetVolParms` attributes.

`kUserIsOwner`

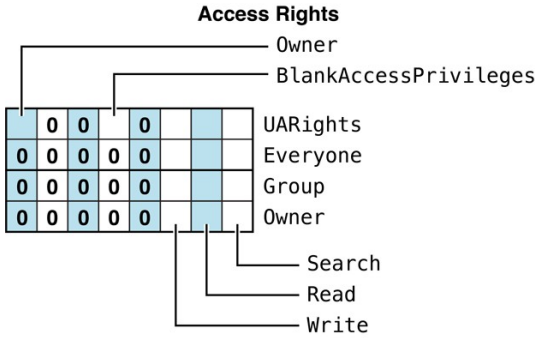
Set to 1 if the current user is the owner of the file or directory. Also set to 1 if if the file or directory is not owned by a registered user.

Discussion

Call `FPGetFileDirParms` to get the Access Rights bitmap.

Figure 83 shows the Access Rights bitmap.

Figure 83 Access Rights bitmap



File and Directory Bitmap

A 16-bit value whose bits are used to get and set file and directory parameters.

```
enum {
   kFPAttributeBit = 0x1,
   kFPParentDirIDBit = 0x2,
   kFPCreateDateBit = 0x4,
   kFPModDateBit = 0x8,
   kFPBackupDateBit = 0x10,
   kFPFinderInfoBit = 0x20,
   kFPLongNameBit = 0x40,
   kFPShortNameBit = 0x80,
   kFPNodeIDBit = 0x100,

   /* Bits that apply only to directories: */
   kFPOffspringCountBit = 0x0200,
   kFPOwnerIDBit = 0x0400,
   kFPGroupIDBit = 0x0800,
   kFPAccessRightsBit = 0x1000,

   /* Bits that apply only to files (same bits as previous group): */
   kFPDataForkLenBit = 0x0200,
   kFPRsrcForkLenBit = 0x0400,
   kFPExtDataForkLenBit = 0x0800, // In AFP version 3.0 and later
   kFPLaunchLimitBit = 0x1000,

   /* Bits that apply to everything except where noted: */
   kFPProDOSInfoBit = 0x2000      // Deprecated; AFP version 2.2 and earlier
   kFPUTF8NameBit = 0x2000,       // AFP version 3.0 and later
   kFPExtRsrcForkLenBit = 0x4000, // Files only; AFP version 3.0 and later
   kFPUnixPrivsBit = 0x8000       // AFP version 3.0 and later
   kFPUUID = 0x10000              // Directories only; AFP version 3.2 and later (with ACL support)
};
```

Constants

`kFPAttributeBit`

If the item is a file and the `kFPAttributeBit` is set in the request, the reply contains a `uint16_t` value containing bits defined by the file attributes bitmap.. If the item is a directory and the `kFPAttributeBit` is set in the request, the reply contains a `uint16_t` value containing bits defined by the directory attributes bitmap. These bitmaps are described in “File and Directory Attributes Bitmap.”

`kFPParentDirIDBit`
Gets the unique ID of the enclosing directory (a `uint32_t` value).

`kFPCreateDateBit`
Gets the creation date in Macintosh date format (`uint32_t` containing the number of seconds since midnight on 01/01/1904). See "Date-Time Values" in *Apple Filing Protocol Programming Guide* for more information.

`kFPModDateBit`
Gets the date of last modification in Macintosh date format (`uint32_t` containing the number of seconds since midnight on 01/01/1904). See "Date-Time Values" in *Apple Filing Protocol Programming Guide* for more information.

`kFPBackupDateBit`
Gets the date of last backup in Macintosh date format (`uint32_t` containing the number of seconds since midnight on 01/01/1904). See "Date-Time Values" in *Apple Filing Protocol Programming Guide* for more information.

`kFPFinderInfoBit`
Gets the Finder info data (32 bytes). This data is available for files and directories on HFS or HFS+ volumes. It is not interpreted by the AFP server or client software in any way.

`kFPLongNameBit`
Gets the long name. (Format is Pascal string of up to 32 characters.) See "Catalog Node Names" in *Apple Filing Protocol Programming Guide* for more information.

`kFPShortNameBit`
Gets the short name. (Format is Pascal string of up to 12 characters.) See "Catalog Node Names" in *Apple Filing Protocol Programming Guide* for more information.

`kFPNodeIDBit`
Gets the node ID (a `uint32_t` value). (In OS X, this is obtained by calling `PBGetCatInfoSync` or `PBGetCatInfoAsync`.)

`kFPOffspringCountBit`
For directories, gets the number of files and folders in the directory (a `uint32_t` value). For files, this bit is `kFPDataForkLenBit`.

`kFPOwnerIDBit`
For directories, gets the owner ID (a `uint32_t` value). See "AFP File Server Security" in *Apple Filing Protocol Programming Guide* for more information.

For files, this bit is `kFPRsrcForkLenBit`.

`kFPGroupIDBit`
For directories, gets the group ID (a `uint32_t` value). See "AFP File Server Security" in *Apple Filing Protocol Programming Guide* for more information.

For files, this bit is `kFPExtDataForkLenBit`.

`kFPAccessRightsBit`
For directories, gets the access rights bitmap, a `uint32_t` value that describes the access rights for the directory's owner, group affiliation, and Everyone. This bitmap also includes the `UARights` summary byte. For files, this bit is `kFPLaunchLimitBit`. For more information, see "Access Rights Bitmap."

`kFPDataForkLenBit`
For files, gets the data fork length (in a `uint32_t`). If the data fork's length is greater than 4 GB, specifying this bit returns the actual length of the data fork. If the data fork's length is greater than 4 GB, specifying this bit returns 4 GB.

For directories, this bit is `kFPOffspringCountBit`.

`kFPRsrcForkLenBit`
For files, gets the resource fork length (in a `uint32_t`). If the resource fork's length is greater than 4 GB, specifying this bit returns the actual length of the data fork. If the data fork's length is greater than 4 GB, specifying this bit returns 4 GB.

For directories, this bit is `kFPOwnerIDBit`.

`kFPExtDataForkLenBit`

For files, gets the data fork length (in a `uint64_t`). For directories, this bit is `kFPGroupIDBit`.

`kFPLaunchLimitBit`
Obsolete. For files, used to limit the number of concurrent copies of an application. Not supported in OS X. For directories, this bit is `kFPAccessRightsBit`.

`kFPProDOSInfoBit`
For AFP versions 2.2 and earlier, used by the Apple II series to obtain the ProDOS name for a file. This flag has been reused in AFP 3.0 and later for `kFPUTF8NameBit`. The AFP server in OS X does not support this flag or ProDOS clients.

`kFPUTF8NameBit`
Gets the filename in UTF-8 encoding. Replaces the obsolete `kFPProDOSInfoBit` flag. See "Catalog Node Names" in *Apple Filing Protocol Programming Guide* for more information.

`kFPExtRsrcForkLenBit`
For files, gets the resource fork length (in a `uint64_t`). Not valid for directories.

`kFPUnixPrivsBit`
Gets the UNIX privileges for the directory. This value is a 16-byte `FPUnixPrivs` structure.

`kFPUUID`
For directories, gets the UUID for the directory. Not valid for files.

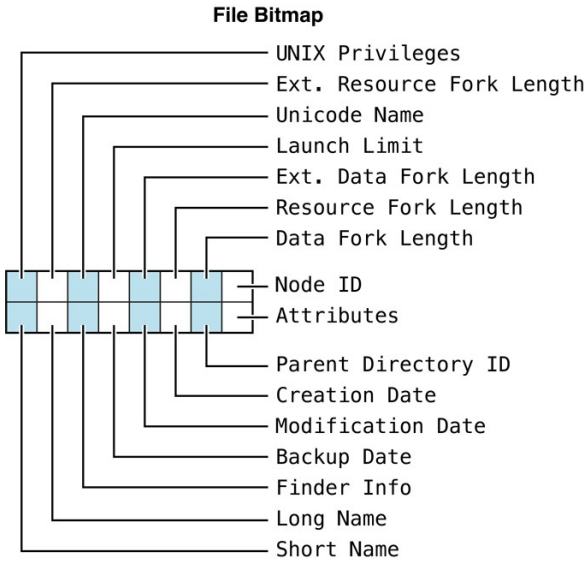
Discussion

The File and Directory bitmap differs slightly in behavior depending on whether it is applied to a file or to a directory. The two meanings for each bit are illustrated by the following figures.

The File bitmap is used when calling `FPGetFileDirParms` to indicate the file parameters you want to get. It is also used when calling `FPSetFileParms` and `FPSetFileDirParms` to set file parameters.

Figure 84 describes the File bitmap.

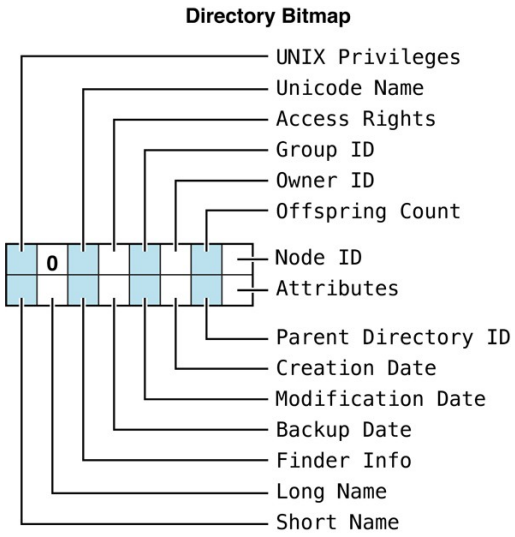
Figure 84 File bitmap



The Directory bitmap is used when calling `FPGetFileDirParms` to indicate the directory parameters you want to get. It is also used when calling `FPSetDirParms` and `FPSetFileDirParms` to set directory parameters.

Figure 85 describes the Directory bitmap.

Figure 85 Directory bitmap



Note: Node IDs *must* be unique for all files and directories on a share point. These IDs are used for the `FPResolveID` call and as a unique identifier in various parts of the AFP stack.

File and Directory Attributes Bitmap

A 16-bit value whose bits provide additional information about a file.

```
enum {
    kFPInvisibleBit = 0x01,

    kFPMultiUserBit = 0x02,     // for files
    kAttrIsExpFolder = 0x02,    // for directories

    kFPSystemBit = 0x04,

    kFPDAlreadyOpenBit = 0x08, // for files
    kAttrMounted = 0x08,       // for directories

    kFPRAlreadyOpenBit = 0x10, // for files
    kAttrInExpFolder = 0x10,   // for directories

    kFPWriteInhibitBit = 0x20,
    kFPBackUpNeededBit = 0x40,
    kFPRenameInhibitBit = 0x80,
    kFPDeleteInhibitBit = 0x100,
    kFPCopyProtectBit = 0x400,
    kFPSetClearBit = 0x8000
};
```

Constants

`kFPInvisibleBit`

The file or directory should not be made visible to the user. This bit is get and set using the `finderInfo` data structure as `kInvisible` (`0x4000`). It is sent in AFP using the attributes field of `FPSetFileDirParms`.

`kAttrIsExpFolder`

The directory is a share point. This directory, and all directories within it, indicate to the user that access privileges are valid (for example, by displaying tabbed folders or drop-box folder icons or by enabling the Sharing menu item). None of the directories outside the shared (exported) area show access privileges on local computers, although they may still have valid access privilege information that only an administrator can see or modify. This bit is a read only bit. It cannot be set by `FPSetFileDirParms`.

This bit is ignored by OS X clients. OS X Server does set this bit if a directory is a share point.

`kFPMultiUserBit`

Tells the client that multiple users may launch an application from multiple AFP clients at the same time. Although still supported in the client, this bit is primarily of historical interest for Mac OS 9 applications. This bit is get and set using the `kIsShared` (`0x0040`) bit of the `finderInfo` data structure, and is sent in AFP using the attributes field. In OS X Server, this flag is ignored and is always set to `true` (`1`).

`kFPSystemBit`

Indicates that the folder is a system directory or file; the definition of "system directory or file" is left to the local computer. Ignored in Mac OS 9 and later.

`kAttrMounted`

The directory is mounted by a user who is not an administrator. The icon for such a folder indicates to the user of the local computer that this directory is a share point, and that a remote user currently has it mounted. This bit is a read only bit. It cannot be set by `FPSetFileDirParms`.

This bit is ignored by OS X clients. OS X Server does set this bit if a mount point is open by multiple clients..

`kAttrInExpFolder`

The directory is in a shared area. This directory, and all directories within this directory, indicate to the user that access privileges are valid. This directory cannot be shared because a share point cannot exist within another share point. This bit is a read only bit. It cannot be set by `FPSetFileDirParms`.

This bit is ignored by OS X clients. OS X Server does set this bit if a directory is within a sharepoint.

`kFPDAlreadyOpenBit`

Data fork is already open. OS X's client implementation ignores this flag, but Mac OS 9 clients may not. OS X Server does set this bit if a file's data fork is open by multiple clients. This data is obtained from the `nodeFlags` field of `FSCatalogInfo`.

`kFPRAlreadyOpenBit`

Resource fork is already open. OS X's client implementation ignores these flags, but Mac OS 9 clients may not. OS X Server does set this bit if a file's resource fork is open by multiple clients. This data is obtained from the `nodeFlags` field of `FSCatalogInfo`.

`kFPWriteInhibitBit`

Indicates that the file cannot be written to. This is set if the `SF_IMMUTABLE` (super-user immutable) or `UR_IMMUTABLE` (owner immutable) flags are set. (Delete inhibit and rename inhibit are also set if these flags are set.)

`kFPBackUpNeededBit`

Obsolete. Indicates that the file or directory needs to be backed up. This bit is set whenever the directory's modification date-time is modified.

This bit is ignored by OS X clients and is not supported in AppleShare Client 3.8 and later or in OS X.

`kFPRenameInhibitBit`

The directory cannot be renamed. This is set if the `SF_IMMUTABLE` (super-user immutable) or `UR_IMMUTABLE` (owner immutable) flags are set. (Write inhibit and delete inhibit are also set if these flags are set.)

`kFPDeleteInhibitBit`

The directory cannot be deleted. This is set if the `SF_IMMUTABLE` (super-user immutable) or `UR_IMMUTABLE` (owner immutable) flags are set. (Write inhibit and rename inhibit are also set if these flags are set.)

`kFPCopyProtectBit`

Obsolete. Indicated that copying the file should not be allowed. Not supported in OS X.

`kFPSetClearBit`

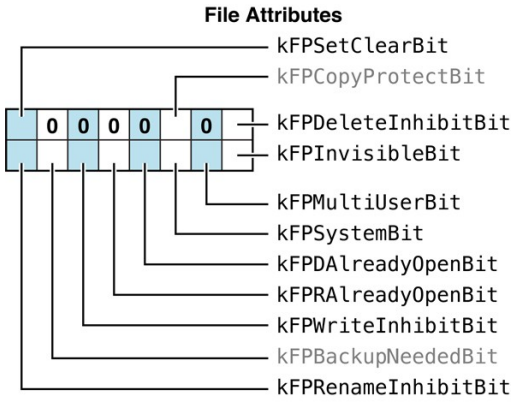
When calling `FPSetDirParms` and `FPSetFileDirParms`, if this bit is set to 1, the attributes associated with any 1 bits in the bitmap are set. If this bit is set to 0, the attributes associated with any 1 bits in the bitmap are cleared. It is not possible to set some attributes and clear other attributes in the same call.

Discussion

Use the bits in the File Attributes bitmap to inhibit writing, renaming or deleting the file. Other bits in the File Attributes bitmap indicate whether the file needs to be backed up, whether the file can be copied, whether the file is invisible or a system file, whether the file's data or resource fork is open, and whether the file can be opened at the same time by multiple users. When calling `FPSetFileParms` and `FPSetFileDirParms` to set File Attributes, use the Set/Clear bit (bit 15) to indicate whether you are setting or clearing a file attribute.

Figure 86 describes the Attributes bitmap for a file.

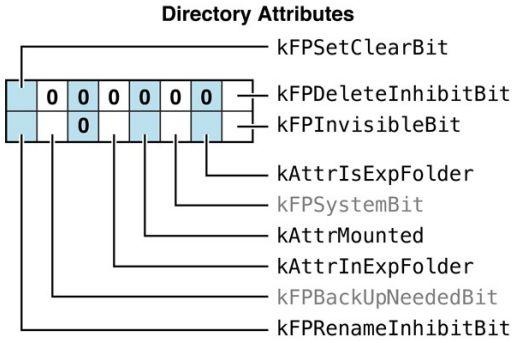
Figure 86 File attributes bitmap



Use the bits in the Directory Attributes bitmap to inhibit renaming or deleting the directory. Other bits in the Directory Attributes bitmap indicate whether the directory needs to be backed up, whether the directory is mounted by a user, whether the directory is invisible or a system directory, and whether the directory is in a shared area or is a share point. When calling `FPSetDirParms` and `FPGetFileDirParms` to set Directory Attributes, use the Set/Clear bit (bit 15) to indicate whether you are setting or clearing a directory attribute.

Figure 87 describes the Attributes bitmap for a directory.

Figure 87 Directory attributes bitmap



Extended Attributes Bitmap

Constants that control the behavior when setting extended attributes.

```
enum {
    kXAttrNoFollow = 0x1,
    kXAttrCreate = 0x2,
    kXAttrReplace = 0x4
};
```

Constants

`kXAttrNoFollow`
If set, do not follow symbolic links.

`kXAttrCreate`
If set, `FPSetExtAttr` fails if the extended attribute already exists.

`kXAttrReplace`
If set, `FPSetExtAttr` fails if the extended attribute does not exist.

Discussion

Use these constants in the Bitmap parameter of the `FPGetExtAttr`, `FPSetExtAttr`, and `FPRemoveExtAttr` commands to get, set, and remove extended attributes.

Server Flags Bitmap

A 16-bit value that describes server capabilities.

```
enum {
   kSupportsCopyfile = 0x01,
   kSupportsChgPwd = 0x02,
   kDontAllowSavePwd = 0x04,
   kSupportsSrvrMsg = 0x08,
   kSrvrSig = 0x10,
   kSupportsTCP = 0x20,
   kSupportsSrvrNotify = 0x40,
   kSupportsReconnect = 0x80,
   kSupportsDirServices = 0x100,
   kSupportsUTF8SrvrName = 0x200,
   kSupportsUUIDs = 0x400,
   kSupportsExtSleep = 0x800,
   kSupportsSuperClient = 0x8000
};
```

Constants

`kSupportsCopyfile`
Indicates that the server supports `FPCopyFile`.

`kSupportsChgPwd`
Indicates that the server allows the user to change passwords through AFP (using `FPChangePassword`).

`kDontAllowSavePwd`
Obsolete. Set if the client should not allow the user to save his or her password for volumes mounted at system startup. The item-selection dialog box may still allow the user to save his or her name. However, when this bit is set, the button offering that option is not displayed. Not used in OS X.

`kSupportsSrvrMsg`
Indicates that the server supports server messages (using `FPGetSrvrMsg`).

`kSrvrSig`
Indicates that the server supports the optional `ServerSignature` parameter in `FPGetSrvrInfo` used for identifying the server. A server signature is a 16-byte number that uniquely identifies the server. The client uses this signature to determine if it is already logged into the server. (This feature is important when the server is configured for multihoming.)

`kSupportsTCP`
Indicates that the server supports AFP over TCP/IP.

`kSupportsSrvrNotify`
Server supports sending DSI Attention packets with the "Server Notification" pattern (`0011`). See `DSIAttention` for more information.

`kSupportsReconnect`
Indicates that the server supports the reconnect UAM and the `FPGetSessionToken` and `FPDisconnectOldSession` commands. See “Reconnect” in *Apple Filing Protocol Programming Guide* and “Reconnecting Sessions” in *Apple Filing Protocol Programming Guide* for more information about reconnecting.

`kSupportsDirServices`
Indicates that the server supports using a directory service (usually Kerberos).

`kSupportsUTF8SrvrName`
Indicates that the server supports server names in UTF-8 encoding. If this flag is set, the `FPGetSrvrInfo` reply packet is in UTF-8 encoding.

`kSupportsUUIDs`
Indicates that the server supports Universally Unique Identifiers (UUIDs).

`kSupportsExtSleep`
Indicates that the server supports the extended sleep functionality. See `FPZzzzz` for more information.

`kSupportsSuperClient`
Obsolete. (Prior to OS X, this indicated that the server could handle multiple outstanding requests.)

Discussion
The Server Flags bitmap is returned by the `FPGetSrvrInfo` command.

Volume Bitmap

A 16-bit value whose bits are used to get and set volume parameters.

```
enum {
    kFPVolAttributeBit = 0x1,
    kFPVolSignatureBit = 0x2,
    kFPVolCreateDateBit = 0x4,
    kFPVolModDateBit = 0x8,
    kFPVolBackupDateBit = 0x10,
    kFPVolIDBit = 0x20,
    kFPVolBytesFreeBit = 0x40,
    kFPVolBytesTotalBit = 0x80,
    kFPVolNameBit = 0x100,
    kFPVolExtBytesFreeBit = 0x200,
    kFPVolExtBytesTotalBit = 0x400,
    kFPVolBlockSizeBit = 0x800
};
```

Constants
`kFPVolAttributeBit`
If set to 1, the response block contains a `uint16_t` value containing bits defined by the “Volume Attributes Bitmap.”

`kFPVolSignatureBit`
Returns the volume signature. The volume signature identifies the volume type (flat, fixed Directory ID, or variable Directory ID).

Table 75 Volume types

Value	Description
1	Flat (no directories supported)
2	Fixed Directory ID
3	Variable Directory ID (deprecated)

For more details, see the section “Apple Filing Protocol Concepts” in *Apple Filing Protocol Programming Guide*.

`kFPVolCreateDateBit`
The date the volume was created in Macintosh date format (`uint32_t` containing the number of seconds since midnight on 01/01/1904). This parameter cannot be modified by an AFP client.

`kFPVolModDateBit`
The date the volume was last modified in Macintosh date format (`uint32_t` containing the number of seconds since midnight on 01/01/1904). This parameter cannot be modified by an AFP client.

`kFPVolBackupDateBit`
The date the volume was last backed up in Macintosh date format (`uint32_t` containing the number of seconds since midnight on 01/01/1904). Set by backup programs each time the volume’s contents are backed up. When a volume is created, the Backup Date is set to 0x80000000 (the earliest representable date-time value). This parameter cannot be modified by an AFP client.

`kFPVolIDBit`

The volume ID (`uint32_t`). For each session between the server and an AFP client, the server assigns a Volume ID to each of its volumes. This value is unique among the volumes of a given server for that session. This parameter cannot be modified by an AFP client.

`kFPVolBytesFreeBit`

The number of free bytes on the AFP volume as a `uint32_t` value. If a volume is more than 4 GB, this value may not reflect the actual free space. In general, you should use `kFPVolExtBytesFreeBit` instead. This value is maintained by the server and cannot be modified by an AFP client. This parameter cannot be modified by an AFP client.

`kFPVolBytesTotalBit`

The total number of bytes (free + used) on the AFP volume as a `uint32_t` value. If a volume is more than 4 GB, this value may not reflect the actual total space. In general, you should use `kFPVolExtBytesTotalBit` instead. This parameter cannot be modified by an AFP client.

`kFPVolNameBit`

The volume name as a string. The volume name identifies a server volume to an AFP client user, so it must be unique among all volumes managed by the server. All eight-bit ASCII characters, except null (0x00) and colon (0x3A), are permitted in a volume name. This name is not used directly to specify files and directories on the volume. Instead, the AFP client sends an AFP command to obtain a particular volume identifier, which it then uses when sending subsequent AFP commands. For more information, see “Apple Filing Protocol Concepts” in *Apple Filing Protocol Programming Guide*.

`kFPVolExtBytesFreeBit`

The number of free bytes on the AFP volume as a `uint64_t` value. This parameter cannot be modified by an AFP client.

`kFPVolExtBytesTotalBit`

The total number of bytes (free + used) on the AFP volume as a `uint64_t` value. This parameter cannot be modified by an AFP client.

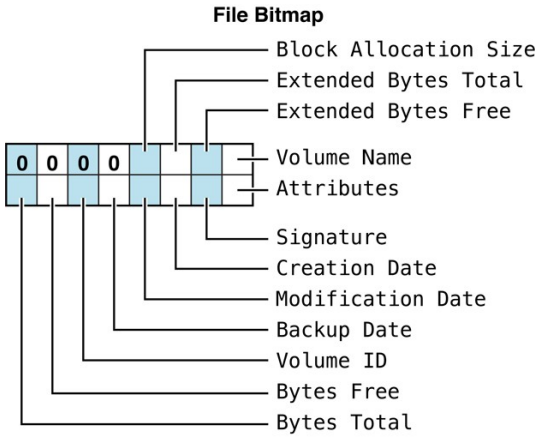
`kFPVolBlockSizeBit`

The logical block size of the AFP volume. This parameter cannot be modified by an AFP client.

Discussion

The Volume bitmap is used when calling `FPGetVolParms` to indicate the volume parameters you want to get. It is also used when calling `FPSetVolParms` to set a volume’s backup date, which is the only Volume parameter that an AFP client can set. Figure 88 describes the Volume bitmap.

Figure 88 Volume bitmap



Volume Attributes Bitmap

A 16-bit value whose bits describe how a volume is mounted and whether it supports certain AFP features.

```
enum {
   kReadOnly = 0x01,
   kHasVolumePassword = 0x02,
   kSupportsFileIDs = 0x04,
   kSupportsCatSearch = 0x08,
   kSupportsBlankAccessPrivs = 0x10,
   kSupportsUnixPrivs = 0x20,
   kSupportsUTF8Names = 0x40,
   kNoNetworkUserIDs = 0x80,
   kDefaultPrivsFromParent = 0x100,
   kNoExchangeFiles = 0x200,
   kSupportsExtAttrs = 0x400,
   kSupportsACLs = 0x800,
   kCaseSensitive = 0x1000,
   kSupportsTMLockSteal = 0x2000
};
```

Constants

`kReadOnly`
Volume is a read-only volume.

`kHasVolumePassword`
Volume has a password. This bit is the same as the `HasPassword` bit returned for each volume by `FPGetSrvrParms`.

`kSupportsFileIDs`
Volume supports obtaining file IDs. In general, if file IDs are supported on one volume, they are supported on all volumes, but this bit allows the server to be more selective, if necessary.

`kSupportsCatSearch`
Volume supports searching the catalog tree with the `FPCatSearch` and `FPCatSearchExt` commands. Support for `FPCatSearch` and `FPCatSearchExt` is optional. This bit allows the server to make this capability available on a per-volume basis.

`kSupportsBlankAccessPrivs`
If set, the volume has a Supports Blank Access Privileges bit that, when set for a directory, causes the directory to inherit its access privileges from its parent directory.

> **Note:** This bit is deprecated and is replaced by `kDefaultPrivsFromParent` in the `FPGetVolParms` attributes.

`kSupportsUnixPrivs`
Volume supports the UNIX (owner/group/other) permissions model.

`kSupportsUTF8Names`
Volume supports UTF-8-encoded user names, group names, and pathnames.

`kNoNetworkUserIDs`
If this is set by the server, the client will always use mapped privileges. See “AFP File Server Security” in *Apple Filing Protocol Programming Guide* for more information about privilege mapping.

`kDefaultPrivsFromParent`
Newly created directories inherit default privileges from the parent directory.

`kNoExchangeFiles`
Volume does *not* support the `FPExchangeFiles` AFP command.

`kSupportsExtAttrs`
Volume supports extended attributes.

`kSupportsACLs`
Volume supports access control lists.

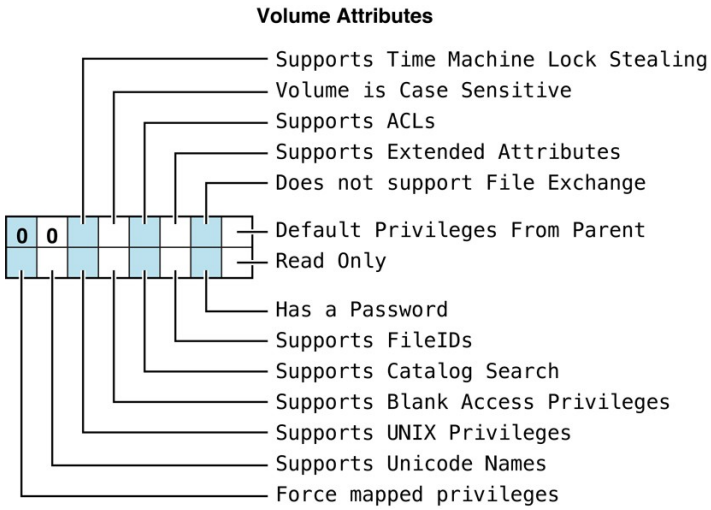
`kCaseSensitive`
Volume supports case-sensitive filenames.

`kSupportsTMLockSteal`
Volume supports Time Machine lock stealing. See *Time Machine Network Interface Specification (TMNIS)* for more information.

Discussion

Figure 89 describes the Attributes bitmap for a volume.

Figure 89 Volume attributes bitmap



See the Character Encoding section of “Apple Filing Protocol Concepts” in *Apple Filing Protocol Programming Guide* for additional details about the UTF-8 encoding used by AFP.

AFP Text Encodings

The text encodings supported by AFP.

```
enum {
    kTextEncodingMacRoman = 0,
    kTextEncodingMacJapanese = 1,
    kTextEncodingMacChineseTrad = 2,
    kTextEncodingMacKorean = 3,
    kTextEncodingMacArabic = 4,
    kTextEncodingMacHebrew = 5,
    kTextEncodingMacGreek = 6,
    kTextEncodingMacCyrillic = 7,
    kTextEncodingMacDevanagari = 9,
    kTextEncodingMacGurmukhi = 10,
    kTextEncodingMacGujarati = 11,
    kTextEncodingMacOriya = 12,
    kTextEncodingMacBengali = 13,
    kTextEncodingMacTamil = 14,
    kTextEncodingMacTelugu = 15,
    kTextEncodingMacKannada = 16,
    kTextEncodingMacMalayalam = 17,
    kTextEncodingMacSinhalese = 18,
    kTextEncodingMacBurmese = 19,
    kTextEncodingMacKhmer = 20,
    kTextEncodingMacThai = 21,
    kTextEncodingMacLaotian = 22,
    kTextEncodingMacGeorgian = 23,
    kTextEncodingMacArmenian = 24,
    kTextEncodingMacChineseSimp = 25,
    kTextEncodingMacTibetan = 26,
    kTextEncodingMacMongolian = 27,
    kTextEncodingMacEthiopic = 28,
    kTextEncodingMacCentralEurRoman = 29,
    kTextEncodingMacVietnamese = 30,
    kTextEncodingMacExtArabic = 31,
    kTextEncodingMacSymbol = 33,
    kTextEncodingMacDingbats = 34,
    kTextEncodingMacTurkish = 35,
```

```
    kTextEncodingMacCroatian = 36,
    kTextEncodingMacIcelandic = 37,
    kTextEncodingMacRomanian = 38,
    kTextEncodingMacCeltic = 39,
    kTextEncodingMacGaelic = 40,
    kTextEncodingMacKeyboardGlyphs = 41,
    kTextEncodingMacUnicode = 126,
    kTextEncodingMacFarsi = 140,
    kTextEncodingMacUkrainian = 152,
    kTextEncodingMacInuit = 236,
    kTextEncodingMacVT100 = 252,
    kTextEncodingMacHFS = 255,
    kTextEncodingUnicodeDefault = 256,
    kTextEncodingUnicodeV1_1 = 257,
    kTextEncodingISO10646_1993 = 257,
    kTextEncodingUnicodeV2_0 = 259,
    kTextEncodingUnicodeV2_1 = 259,
    kTextEncodingUnicodeV3_0 = 260,
    kTextEncodingISOLatin1 = 513,
    kTextEncodingISOLatin2 = 514,
    kTextEncodingISOLatin3 = 515,
    kTextEncodingISOLatin4 = 516,
    kTextEncodingISOLatinCyrillic = 517,
    kTextEncodingISOLatinArabic = 518,
    kTextEncodingISOLatinGreek = 519,
    kTextEncodingISOLatinHebrew = 520,
    kTextEncodingISOLatin5 = 521,
    kTextEncodingISOLatin6 = 522,
    kTextEncodingISOLatin7 = 525,
    kTextEncodingISOLatin8 = 526,
    kTextEncodingISOLatin9 = 527,
    kTextEncodingDOSLatinUS = 1024,
    kTextEncodingDOSGreek = 1029,
    kTextEncodingDOSBalticRim = 1030,
    kTextEncodingDOSLatin1 = 1040,
    kTextEncodingDOSGreek1 = 1041,
    kTextEncodingDOSLatin2 = 1042,
    kTextEncodingDOSCyrillic = 1043,
    kTextEncodingDOSTurkish = 1044,
    kTextEncodingDOSPortuguese = 1045,
    kTextEncodingDOSIcelandic = 1046,
    kTextEncodingDOSHebrew = 1047,
    kTextEncodingDOSCanadianFrench = 1048,
    kTextEncodingDOSArabic = 1049,
    kTextEncodingDOSNordic = 1050,
    kTextEncodingDOSRussian = 1051,
    kTextEncodingDOSGreek2 = 1052,
    kTextEncodingDOSThai = 1053,
    kTextEncodingDOSJapanese = 1056,
    kTextEncodingDOSChineseSimplif = 1057,
    kTextEncodingDOSKorean = 1058,
    kTextEncodingDOSChineseTrad = 1059,
    kTextEncodingWindowsLatin1 = 1280,
    kTextEncodingWindowsANSI = 1280,
    kTextEncodingWindowsLatin2 = 1281,
    kTextEncodingWindowsCyrillic = 1282,
    kTextEncodingWindowsGreek = 1283,
    kTextEncodingWindowsLatin5 = 1284,
    kTextEncodingWindowsHebrew = 1285,
    kTextEncodingWindowsArabic = 1286,
    kTextEncodingWindowsBalticRim = 1287,
    kTextEncodingWindowsVietnamese = 1288,
    kTextEncodingWindowsKoreanJohab = 1296,
    kTextEncodingUS_ASCII = 1536,
    kTextEncodingJIS_X0201_76 = 1568,
    kTextEncodingJIS_X0208_83 = 1569,
    kTextEncodingJIS_X0208_90 = 1570
};
```

DSI Transport Layer Constants

AFPUserBytes Definitions

The `AFPUserBytes` bytes make up the 2-byte attention code sent in a DSI Attention packet to the AFP client. This section describes the `AFPUserBytes` values.

```
enum {
    kShutDownNotifyMask = 0x8000,
    kAllowReconnectMask = 0x4000,
    kMsgNotifyMask = 0x2000,
    kDisconnectNotifyMask = 0x1000,
};
```

Constants

`kShutDownNotifyMask`

Bit 15: Shutdown or Attention bit. This bit is used when the server is being shut down or one or more users are being disconnected.

`kAllowReconnectMask`

Bit 14: Server Crash bit. The server has detected an internal error, and the session will close immediately with minimal flushing of files. There may be some data loss. This condition is never accompanied by a server message and is highly unlikely to occur.

`kMsgNotifyMask`

Bit 13: Server Message bit. There is a server message that the client should request by calling FPGetSrvrMsg with a MsgType of "Server." For more information, see the section "FPGetSrvrMsg" (page 55). The client should request the message as soon as possible after receiving this attention code. Otherwise, the server message it receives could be out of date.

`kDisconnectNotifyMask`

Bit 12: Don't Reconnect bit. This bit is set when the user is disconnected, so that the client's reconnect code does not attempt to reconnect the session. This bit is not set for normal server shutdowns and is not set when the server loses power or when there is a break in network cabling. This mechanism allows administrators to shut down the server for backup purposes, bring the server up, and allow disconnected clients to reconnect transparently. This bit is ignored when the number of minutes is any value other than zero.

Discussion

The `AFPUserBytes` bitfield layout is shown in Figure 90.

Figure 90 `AFPUserBytes` bitfield layout

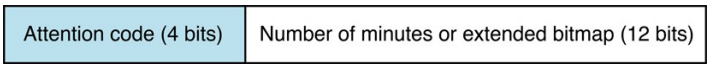


Figure 91 shows how the attention code bits for the AFPUserBytes bytes are defined.

Figure 91 `AFPUserBytes` attention code bits

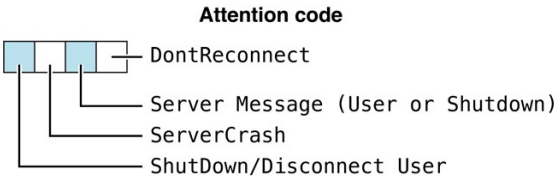


Table 76 lists valid combinations for the attention code bits.

Table 76 Valid combinations for the `AFPUserBytes` Attention Code bits

Combination	Meaning

1000	The server is shutting down in the designated number of minutes, or the user will be disconnected in the designated number of minutes. No message accompanies this shutdown. This attention code may be used when the server shuts down (that is, when the administrator quits file service).
1001	The server is shutting down, or the user will be disconnected in the designated number of minutes. No message accompanies this shutdown. This attention code is used upon user disconnection (for example, when the administrator detects an intruder and disconnects him or her).
1010	The server is shutting down, or the user will be disconnected in the designated number of minutes. A message accompanies this shutdown. The workstation should immediately submit an `FPGetSrvrMsg` command to receive and display the message. This attention code can be used upon server shutdown (that is, when the administrator quits file service).
0100	The server is shutting down immediately, possibly due to an internal error, and can perform only minimal flushing. A message never accompanies this attention code.
1011	The server is shutting down, or the user will be disconnected in the designated number of minutes. A message accompanies this shutdown. The workstation should immediately submit an `FPGetSrvrMsg` command to receive and display the message. This is one of the codes used upon user disconnection (for example, when the administrator detects an intruder and disconnects him or her).
0100	The server is going down immediately (possibly because of an internal error) and can perform only minimal flushing. Number of minutes is ignored. No message ever accompanies such an attention code.
0010	The server has a server message available for this workstation. The workstation should immediately submit an FPGetSrvrMsg command to receive and display the message. The extended bitmap is reserved for Apple Computer's use only.
0011	Server Notification (introduced in AFP 2.2). The server is notifying the client of an event relating to the current session. Bit `0` in the extended bitmap indicates that the modification date of one of the volumes mounted from the server has changed. The client should issue an `FPGetVolParms` command for each volume mounted from the server.
0001	Reserved. The extended bitmap is reserved for Apple Computer's use only.
0000	Reserved. The extended bitmap is reserved for Apple Computer's use only.

Note that for some of the valid bit patterns, the lower 12 bits of `AFPUserBytes` are interpreted as the number of minutes before the action described by the bit pattern will take place. This value can be a number in the range 0 to 4094 ($FFE) inclusive. A value of 4095 ($FFF) means that the action is being canceled.

Result Codes

The result codes specific to the Apple Filing Protocol are listed in the table below.

Result Code	Value	Description
`kFPNoErr`	0	No error (success).

kFPNoMoreSessions	-1068	Server cannot handle additional sessions. This error usually indicates that the server limits the maximum number of concurrent clients, and that this maximum number would be exceeded by honoring this login request.
kASPSessClosed	-1072	ASP session closed.
kFPAccessDenied	-5000	User does not have the access privileges required to use the command.
kFPAuthContinue	-5001	Authentication is not yet complete.
kFPBadUAM	-5002	Specified UAM is unknown
kFPBadVersNum	-5003	Server does not support the specified AFP version.
kFPBitmapErr	-5004	Attempt was made to get or set a parameter that cannot be obtained or set with this command, or a required bitmap is null
kFPCantMove	-5005	Attempt was made to move a directory into one of its descendent directories.
kFPDenyConflict	-5006	Specified fork cannot be opened because of a deny modes conflict.
kFPDirNotEmpty	-5007	Directory is not empty.
kFPDiskFull	-5008	No more space exists on the volume
kFPEOFErr	-5009	No more matches or end of fork reached.
kFPFileBusy	-5010	When attempting a hard create, the file already exists and is open.
kFPFlatVol	-5011	Volume is flat and does not support directories.
kFPItemNotFound	-5012	Specified APPL mapping, comment, or icon was not found in the Desktop database; specified ID is unknown. Beginning in AFP 3.4, the POSIX error code ENOATTR maps onto this error code. In prior AFP versions, the ENOATTR error was mapped on to the "kFPMiscErr" error code.
kFPLockErr	-5013	Some or all of the requested range is locked by another user; a lock range conflict exists.
kFPMiscErr	-5014	Non-AFP error occurred.
kFPNoMoreLocks	-5015	Server's maximum lock count has been reached.
kFPNoServer	-5016	Server is not responding.
kFPObjectExists	-5017	File or directory already exists.
kFPObjectNotFound	-5018	Input parameters do not point to an existing directory, file, or volume.
kFPParamErr	-5019	Session reference number, Desktop database reference number, open fork reference number, Volume ID, Directory ID, File ID, Group ID, or subfunction is unknown; byte range starts before byte zero; pathname is invalid; pathname type is unknown; user name is null, exceeds the UAM's user name length limit, or does not exist, MaxReplySize is too small to hold a single offspring structure, ThisUser bit is not set, authentication failed for an undisclosed

		reason, specified user is unknown or the account has been disabled due to too many login attempts; ReqCount or Offset is negative; `NewLineMask` is invalid.
`kFPRangeNotLocked`	-5020	Attempt to unlock a range that is locked by another user or that is not locked at all.
`kFPRangeOverlap`	-5021	User tried to lock some or all of a range that the user has already locked.
`kFPSessClosed`	-5022	Session is closed.
`kFPUserNotAuth`	-5023	UAM failed (the specified old password doesn't match); no user is logged in yet for the specified session; authentication failed; password is incorrect.
`kFPCallNotSupported`	-5024	Server does not support this command.
`kFPObjectTypeErr`	-5025	Input parameters point to the wrong type of object.
`kFPTooManyFilesOpen`	-5026	Server cannot open another fork.
`kFPServerGoingDown`	-5027	Server is shutting down.
`kFPCantRename`	-5028	Attempt was made to rename a volume or root directory.
`kFPDirNotFound`	-5029	Input parameters do not point to an existing directory.
`kFPIconTypeError`	-5030	New icon's size is different from the size of the existing icon.
`kFPVolLocked`	-5031	Volume is Read Only.
`kFPObjectLocked`	-5032	File or directory is marked DeleteInhibit; directory being moved, renamed, or moved and renamed is marked RenameInhibit; file being moved and renamed is marked RenameInhibit; attempt was made to open a file for writing that is marked WriteInhibit; attempt was made to rename a file or directory that is marked RenameInhibit.
`kFPContainsSharedErr`	-5033	Directory contains a share point.
`kFPIDNotFound`	-5034	File ID was not found. (No file thread exists.)
`kFPIDExists`	-5035	File already has a File ID.
`kFPDiffVolErr`	-5036	Wrong volume.
`kFPCatalogChanged`	-5037	Catalog has changed.
`kFPSameObjectErr`	-5038	Two objects that should be different are the same object.
`kFPBadIDErr`	-5039	File ID is not valid.
`kFPPwdSameErr`	-5040	User attempted to change his or her password to the same password that is currently set.
`kFPPwdTooShortErr`	-5041	User password is shorter than the server's minimum password length, or user attempted to change password to a password that is shorter than the server's minimum password length.
`kFPPwdExpiredErr`	-5042	User's password has expired.

kFPInsideSharedErr	-5043	Directory being moved contains a share point and is being moved into a directory that is shared or is the descendent of a directory that is shared.
kFPInsideTrashErr	-5044	Shared directory is being moved into the Trash; a directory is being moved to the trash and it contains a shared folder.
kFPPwdNeedsChangeErr	-5045	User's password needs to be changed.
kFPPwdPolicyErr	-5046	New password does not conform to the server's password policy.
kFPDiskQuotaExceeded	-5047	Disk quota exceeded.