Arboreal

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Contents

Chapter 1

README

This is a file for specific code notes. things to do, consider, etc, that doesn't need to clutter up the main readme file.

Doing TRY-CATCH

tageSearch() returns a vector of structs with (string "filename", int fidentifier) [fidentifier can be FIONODE blknum or unique file identifier that is mapped to a FIONDE blknum] Hand off storage of file tagSearch() return vector to Danny to be stored in a "current" buffer or smoe such/

There should probably be an attributes object to make our lives easier. and thats what real filesystems do. **Attributes object should be stored in FINODE or another indirect block who's reference is stored in the FINODE. Which one is used should be decided dynamically, if FIONDE is full get empty data block, store address in FIONDE (migrate data)[optional] to new block, add new data to new block, otherwise add data directly to FIONDE. TAGS ARE ATTRIBUTES**

I think we may need two open functions. One that takes the unique file id,(block number) and one that takes the vector of tags and the file name . similar to a path. **YES**

I removed validName() because we should check for valid input before passing it to our filesystem. as much as possible anyway.

I think we'll be able to get rid of alot of the helper functions actually. because map will be able to do all that for us. the **big helper functions will be reading in a map and writing out a map**. which i think we can just basically write out all the key, value pairs, because a map can do that easily with its iterator. **for reading in, we'll just read in all the key value pairs and add them to the map one by one. Name Length HARD CAPS at size specified in partition info during formatting NEED TREE INODE READING A MAP FROM DISK TO MAIN MEMORY** **---—**

so we'll have to have a reserved spot at the end of a block for a block number to the next block of continuing data.

We should write everything out in plaintext and have a converter that can change it to byte stuff that we can implement later. also we should have a flag that will zero out blocks (FOR SPEED), mainly for debugging. but can also repourpose to an encrypt flag later.

//LATER: we should try not to write out the whole tag tree everytime. instead we should only write out the parts that changed if we can. I know this is a tough solution, if a tag is deleted in the middle of the tree and we really have no way of knowing where stuff will be in the tree... but it might be possible to keep some sort of secondary data structure, like a vector with all the info because it doens't matter what order we reconstruct the map in memory, just that all the data is there. this is also somehting we can implement later. **INtermeidary Data structure will store, (in addition to Memory pointer, block pointer) a tuple (int blknum, int pos_in_blknum) of the key_value pair so we can use it later for delete operations.**

A NOTE about speed: right now, in order to do tag search, we have to read in the finode of each file in the smallest tag tree becuase I am not storing the number of tags associated with a file in the tag tree inodes. This can be changed later, but for now I just want to get it done. If, when we are testing speeds this is something that will surely improve speed.

∗∗Estimated read in time for everything on startup: O(n^2∗log(n))∗∗∗

FileInode structure filename - filenameSize Finode struct = sizeof(finode struct) local tag storage = rest of the space possible tag cont. block = sizeof(blknumType)

Restrictions:

1. filename size restricted to no more than 1/2 block size
2. block size should be a power of 2
3. Hard cap on the number of tags that can be associated with a file. = (((blocksize - filenamesize - 136) / sizeof(BlkNumType)) + (blocksize / sizeof(BlkNumType)). 103 tags for blocksize of 512. and 64b filename
4. max block size = 16k

TODO:

1. Incorporate storing number of tags associated with file in Tag tree on disk, not yet
2. add renameTag function
3. don't allow duplicate tags to be sent to the filesystem when sending a tagset of any kind

Chapter 2

Hierarchical Index

2.1 Class Hierarchy

This inheritance list is sorted roughly, but not completely, alphabetically:

Chapter 3

Class Index

3.1 Class List

Here are the classes, structs, unions and interfaces with brief descriptions:

Chapter 4

File Index

4.1 File List

Here is a list of all files with brief descriptions:

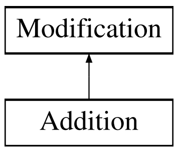
Chapter 5

Class Documentation

5.1 Addition Class Reference

```
#include <Trees.h>
```

Inheritance diagram for Addition:



Public Member Functions

- Addition (TreeObject ∗obj, TreeObject ∗parent)
- ∼Addition ()
- void write_out (PartitionManager ∗pm)

Additional Inherited Members

5.1.1 Constructor & Destructor Documentation

5.1.1.1 Addition()

```
Addition::Addition (
            TreeObject ∗ obj,
            TreeObject ∗ parent )
```

5.1.1.2 ∼Addition()

```
Addition::∼Addition ( )
```

5.1.2 Member Function Documentation

5.1.2.1 write_out()

```
void Addition::write_out (
            PartitionManager ∗ pm )  [virtual]
```

Implements Modification.

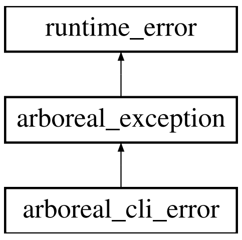
The documentation for this class was generated from the following files:

- Filesystem/DaemonDependancies/Trees/Trees.h
- Filesystem/DaemonDependancies/Trees/Trees.cpp

5.2 arboreal_cli_error Class Reference

```
#include <Arboreal_Exceptions.h>
```

Inheritance diagram for arboreal_cli_error:



Public Member Functions

- arboreal_cli_error (const string &where, const string &what, const int ecode=99)
- arboreal_cli_error (const char ∗what, const char ∗where, const int ecode=99)
- arboreal_cli_error (const char ∗what, const string &where, const int ecode=99)
- arboreal_cli_error (const string &what, const char ∗where, const int ecode=99)
- ∼arboreal_cli_error () throw ()

Additional Inherited Members

5.2.1 Constructor & Destructor Documentation

5.2.1.1 arboreal_cli_error() [1/4]

```
arboreal_cli_error::arboreal_cli_error (
              const string & where,
              const string & what,
              const int ecode = 99 )
```

5.2.1.2 arboreal_cli_error() [2/4]

```
arboreal_cli_error::arboreal_cli_error (
              const char * what,
              const char * where,
              const int ecode = 99 )
```

5.2.1.3 arboreal_cli_error() [3/4]

```
arboreal_cli_error::arboreal_cli_error (
              const char * what,
              const string & where,
              const int ecode = 99 )
```

5.2.1.4 arboreal_cli_error() [4/4]

```
arboreal_cli_error::arboreal_cli_error (
              const string & what,
              const char * where,
              const int ecode = 99 )
```

5.2.1.5 ∼arboreal_cli_error()

```
arboreal_cli_error::∼arboreal_cli_error ( ) throw )
```

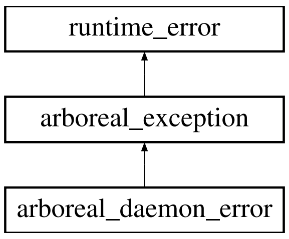
The documentation for this class was generated from the following files:

- SharedHeaders/Arboreal_Exceptions.h
- SharedCPPFiles/Arboreal_Exceptions.cpp

5.3 arboreal_daemon_error Class Reference

```
#include <Arboreal_Exceptions.h>
```

Inheritance diagram for arboreal_daemon_error:



Public Member Functions

- arboreal_daemon_error (const string &where, const string &what, const int ecode=99)
- arboreal_daemon_error (const char ∗what, const char ∗where, const int ecode=99)
- arboreal_daemon_error (const char ∗what, const string &where, const int ecode=99)
- arboreal_daemon_error (const string &what, const char ∗where, const int ecode=99)
- ∼arboreal_daemon_error () throw ()

Additional Inherited Members

5.3.1 Constructor & Destructor Documentation

5.3.1.1 arboreal_daemon_error() [1/4]

```
arboreal_daemon_error::arboreal_daemon_error (
             const string & where,
             const string & what,
             const int ecode = 99 )
```

5.3.1.2 arboreal_daemon_error() [2/4]

```
arboreal_daemon_error::arboreal_daemon_error (
             const char * what,
             const char * where,
             const int ecode = 99 )
```

5.3.1.3 arboreal_daemon_error() [3/4]

```
arboreal_daemon_error::arboreal_daemon_error (
              const char * what,
              const string & where,
              const int ecode = 99 )
```

5.3.1.4 arboreal_daemon_error() [4/4]

```
arboreal_daemon_error::arboreal_daemon_error (
              const string & what,
              const char * where,
              const int ecode = 99 )
```

5.3.1.5 ∼arboreal_daemon_error()

```
arboreal_daemon_error::∼arboreal_daemon_error ( ) throw )
```

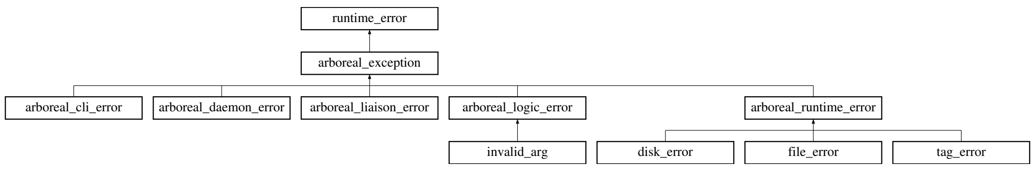
The documentation for this class was generated from the following files:

- SharedHeaders/Arboreal_Exceptions.h
- SharedCPPFiles/Arboreal_Exceptions.cpp

5.4 arboreal_exception Class Reference

```
#include <Arboreal_Exceptions.h>
```

Inheritance diagram for arboreal_exception:



Public Member Functions

- arboreal_exception (const char ∗what, const char ∗where, const int ecode=99)
- arboreal_exception (const char ∗what, const string &where, const int ecode=99)
- arboreal_exception (const string &what, const string &where, const int ecode=99)
- arboreal_exception (const string &what, const char ∗where, const int ecode=99)
- ∼arboreal_exception () throw ()
- virtual const char ∗ where () const
- virtual const int ecode () const

Protected Attributes

- string _where
- int _ecode

5.4.1 Constructor & Destructor Documentation

5.4.1.1 arboreal_exception() [1/4]

```
arboreal_exception::arboreal_exception (
            const char * what,
            const char * where,
            const int ecode = 99 )
```

5.4.1.2 arboreal_exception() [2/4]

```
arboreal_exception::arboreal_exception (
            const char * what,
            const string & where,
            const int ecode = 99 )
```

5.4.1.3 arboreal_exception() [3/4]

```
arboreal_exception::arboreal_exception (
            const string & what,
            const string & where,
            const int ecode = 99 )
```

5.4.1.4 arboreal_exception() [4/4]

```
arboreal_exception::arboreal_exception (
            const string & what,
            const char * where,
            const int ecode = 99 )
```

5.4.1.5 ∼arboreal_exception()

```
arboreal_exception::∼arboreal_exception ( ) throw )
```

5.4.2 Member Function Documentation

5.4.2.1 ecode()

```
const int arboreal_exception::ecode ( ) const  [virtual]
```

5.4.2.2 where()

```
const char * arboreal_exception::where ( ) const  [virtual]
```

5.4.3 Member Data Documentation

5.4.3.1 _ecode

```
int arboreal_exception::_ecode  [protected]
```

5.4.3.2 _where

```
string arboreal_exception::_where  [protected]
```

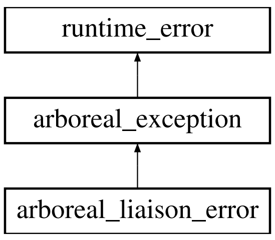
The documentation for this class was generated from the following files:

- SharedHeaders/Arboreal_Exceptions.h
- SharedCPPFiles/Arboreal_Exceptions.cpp

5.5 arboreal_liaison_error Class Reference

```
#include <Arboreal_Exceptions.h>
```

Inheritance diagram for arboreal_liaison_error:



Public Member Functions

- arboreal_liaison_error (const string &where, const string &what, const int ecode=99)
- arboreal_liaison_error (const char ∗what, const char ∗where, const int ecode=99)
- arboreal_liaison_error (const char ∗what, const string &where, const int ecode=99)
- arboreal_liaison_error (const string &what, const char ∗where, const int ecode=99)
- ∼arboreal_liaison_error () throw ()

Additional Inherited Members

5.5.1 Constructor & Destructor Documentation

5.5.1.1 arboreal_liaison_error() [1/4]

```
arboreal_liaison_error::arboreal_liaison_error (
             const string & where,
             const string & what,
             const int ecode = 99 )
```

5.5.1.2 arboreal_liaison_error() [2/4]

```
arboreal_liaison_error::arboreal_liaison_error (
             const char * what,
             const char * where,
             const int ecode = 99 )
```

5.5.1.3 arboreal_liaison_error() [3/4]

```
arboreal_liaison_error::arboreal_liaison_error (
             const char * what,
             const string & where,
             const int ecode = 99 )
```

5.5.1.4 arboreal_liaison_error() [4/4]

```
arboreal_liaison_error::arboreal_liaison_error (
             const string & what,
             const char * where,
             const int ecode = 99 )
```

5.5.1.5 ∼arboreal_liaison_error()

```
arboreal_liaison_error::∼arboreal_liaison_error ( ) throw )
```

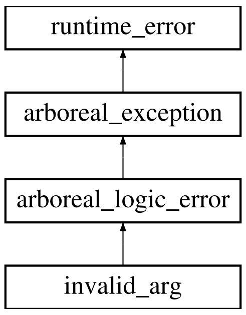
The documentation for this class was generated from the following files:

- SharedHeaders/Arboreal_Exceptions.h
- SharedCPPFiles/Arboreal_Exceptions.cpp

5.6 arboreal_logic_error Class Reference

```
#include <Arboreal_Exceptions.h>
```

Inheritance diagram for arboreal_logic_error:



Public Member Functions

- arboreal_logic_error (const char ∗what, const char ∗where, const int ecode=99)
- arboreal_logic_error (const char ∗what, const string &where, const int ecode=99)
- arboreal_logic_error (const string &what, const string &where, const int ecode=99)
- arboreal_logic_error (const string &what, const char ∗where, const int ecode=99)
- ∼arboreal_logic_error () throw ()

Additional Inherited Members

5.6.1 Constructor & Destructor Documentation

5.6.1.1 arboreal_logic_error() [1/4]

```
arboreal_logic_error::arboreal_logic_error (
             const char ∗ what,
             const char ∗ where,
             const int ecode = 99 )
```

5.6.1.2 arboreal_logic_error() [2/4]

```
arboreal_logic_error::arboreal_logic_error (
         const char * what,
         const string & where,
         const int ecode = 99 )
```

5.6.1.3 arboreal_logic_error() [3/4]

```
arboreal_logic_error::arboreal_logic_error (
         const string & what,
         const string & where,
         const int ecode = 99 )
```

5.6.1.4 arboreal_logic_error() [4/4]

```
arboreal_logic_error::arboreal_logic_error (
         const string & what,
         const char * where,
         const int ecode = 99 )
```

5.6.1.5 ∼arboreal_logic_error()

```
arboreal_logic_error::∼arboreal_logic_error ( ) throw )
```

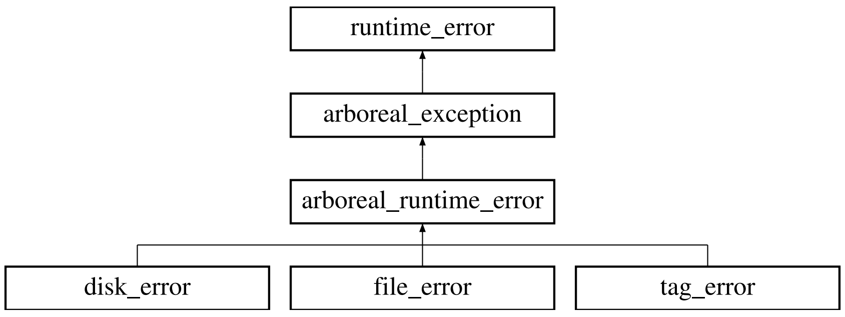
The documentation for this class was generated from the following files:

- SharedHeaders/Arboreal_Exceptions.h
- SharedCPPFiles/Arboreal_Exceptions.cpp

5.7 arboreal_runtime_error Class Reference

```
#include <Arboreal_Exceptions.h>
```

Inheritance diagram for arboreal_runtime_error:



Public Member Functions

- arboreal_runtime_error (const char ∗what, const char ∗where, const int ecode=99)
- arboreal_runtime_error (const char ∗what, const string &where, const int ecode=99)
- arboreal_runtime_error (const string &what, const string &where, const int ecode=99)
- arboreal_runtime_error (const string &what, const char ∗where, const int ecode=99)
- ∼arboreal_runtime_error () throw ()

Protected Attributes

- string _where
- int _ecode

5.7.1 Constructor & Destructor Documentation

5.7.1.1 arboreal_runtime_error() [1/4]

```
arboreal_runtime_error::arboreal_runtime_error (
             const char ∗ what,
             const char ∗ where,
             const int ecode = 99 )
```

5.7.1.2 arboreal_runtime_error() [2/4]

```
arboreal_runtime_error::arboreal_runtime_error (
             const char ∗ what,
             const string & where,
             const int ecode = 99 )
```

5.7.1.3 arboreal_runtime_error() [3/4]

```
arboreal_runtime_error::arboreal_runtime_error (
             const string & what,
             const string & where,
             const int ecode = 99 )
```

5.7.1.4 arboreal_runtime_error() [4/4]

```
arboreal_runtime_error::arboreal_runtime_error (
             const string & what,
             const char * where,
             const int ecode = 99 )
```

5.7.1.5 ∼arboreal_runtime_error()

```
arboreal_runtime_error::∼arboreal_runtime_error ( ) throw )
```

5.7.2 Member Data Documentation

5.7.2.1 _ecode

```
int arboreal_runtime_error::_ecode [protected]
```

5.7.2.2 _where

```
string arboreal_runtime_error::_where [protected]
```

The documentation for this class was generated from the following files:

- SharedHeaders/Arboreal_Exceptions.h
- SharedCPPFiles/Arboreal_Exceptions.cpp

5.8 Attributes Class Reference

```
#include <Trees.h>
```

Public Member Functions

- Attributes (BlkNumType blknum, PartitionManager ∗pm)

Modifier Functions

- void write_out ()
- void read_in ()
- void del ()
- void set_creation_time ()
- void set_owner (int owner)
- void set_permissions (char ∗perms)
- void set_access ()
- void set_edit ()
- void update_size (size_t size)

Accessor Functions

- time_t get_creation_time ()
- int get_owner ()
- char ∗ get_permissions ()
- time_t get_access ()
- time_t get_edit ()
- size_t get_size ()
- FileAttributes get_file_attributes ()

5.8.1 Constructor & Destructor Documentation

5.8.1.1 Attributes()

```
Attributes::Attributes (
            BlkNumType blknum,
            PartitionManager ∗ pm )
```

5.8.2 Member Function Documentation

5.8.2.1 del()

```
void Attributes::del ( )
```

Removes the Attributes presence on disk

5.8.2.2 get_access()

```
time_t Attributes::get_access ( )
```

Returns

the UNIX time the file was last accessed

5.8.2.3 get_creation_time()

```
time_t Attributes::get_creation_time ( )
```

Returns

the UNIX time the file was created

5.8.2.4 get_edit()

```
time_t Attributes::get_edit ( )
```

Returns

the UNIX time the file was last edited

5.8.2.5 get_file_attributes()

```
FileAttributes Attributes::get_file_attributes ( )
```

Returns

the entire FileAttributes struct

5.8.2.6 get_owner()

```
int Attributes::get_owner ( )
```

Returns

the UID of the owner of the file

5.8.2.7 get_permissions()

```
char * Attributes::get_permissions ( )
```

Returns

the permisssions

See also

FileInfo::get_permissions(char*)

5.8.2.8 get_size()

```
size_t Attributes::get_size ( )
```

Returns

the size of the file in bytes

5.8.2.9 read_in()

```
void Attributes::read_in ( )
```

Reads in the Attributes from disk

5.8.2.10 set_access()

```
void Attributes::set_access ( )
```

Marks down the time as accessed time as UNIX timestamp

5.8.2.11 set_creation_time()

```
void Attributes::set_creation_time ( )
```

Marks down the creation time of the associated FileInfo as UNIX timestamp

5.8.2.12 set_edit()

```
void Attributes::set_edit ( )
```

Marks down the time as modified time as UNIX timestamp

5.8.2.13 set_owner()

```
void Attributes::set_owner (
             int owner )
```

Marks the owner as their UID

5.8.2.14 set_permissions()

```
void Attributes::set_permissions (
             char * perms )
```

sets the permisssions of the file

See also

FileInfo::set_permissions(char*)

5.8.2.15 update_size()

```
void Attributes::update_size (
             size_t size )
```

sets the size to the specified size

5.8.2.16 write_out()

```
void Attributes::write_out ( )
```

Writes out the Attributes to disk

The documentation for this class was generated from the following files:

- Filesystem/DaemonDependancies/Trees/Trees.h
- Filesystem/DaemonDependancies/Trees/Trees.cpp

5.9 CLI Class Reference

```
#include <Cli.h>
```

Public Member Functions

- CLI (char ∗∗partition)
- CLI (char ∗∗partition, bool debug)
- CLI (char ∗∗partition, char ∗isScript)
- CLI (char ∗∗partition, char ∗isScript, bool debug)
- ∼CLI ()
- void start ()
- void run (std::string input)
- void run ()
- char ∗ build (const int id, const std::string input)
- void send_cmnd (const char ∗command)
- void await_response ()

  Block while waiting for response from filesystem.

5.9.1 Constructor & Destructor Documentation

5.9.1.1 CLI() [1/4]

```
CLI::CLI (
            char ** partition )
```

Parameters

partition	A pointer to a charachter array containing the partition name that this particular command line interface will operate in

Constructor for use in Mode 1 of the Command Line Interface Reads from explicit user input Does NOT print debug data to log

5.9.1.2 CLI() [2/4]

```
CLI::CLI (
            char ** partition,
            bool debug )
```

Parameters

partition	A pointer to a charachter array containing the partition name that this particular command line interface will operate in
debug	Wether or not debug messages should be turned on for this interface

Constructor for use in Mode 2 of the Command Line Interface Reads from explicit user input Does PRINTS DEBUG data to log

5.9.1.3 CLI() [3/4]

```
CLI::CLI (
            char ** partition,
            char * isScript )
```

Parameters

partition	A pointer to a charachter array containing the partition name that this particular command line interface will operate in
isScript	Flag telling whether or not the input for this interface will be coming from a file (The flag value is '-s')

Constructor for use in Mode 3 of the Command Line Interface Reads from file Does NOT print debug data to log

5.9.1.4 CLI() [4/4]

```
CLI::CLI (
            char ** partition,
            char * isScript,
            bool debug )
```

Parameters

partition	A pointer to a charachter array containing the partition name that this particular command line interface will operate in
debug	Wether or not debug messages should be turned on for this interface
isScript	Flag telling whether or not the input for this interface will be coming from a file (The flag value is '-s')

Constructor for use in Mode 3 of the Command Line Interface Reads from file Does PRINTS DEBUG data to log

5.9.1.5 ∼CLI()

```
CLI::∼CLI ( )
```

Default Destructor

5.9.2 Member Function Documentation

5.9.2.1 await_response()

```
void CLI::await_response ( )
```

Block while waiting for response from filesystem.

Receive data from the liaison process The data is X number of charachters The data can be anything from a list of files returned by the 'find' operation To an error message. This function blocks until it receives data.

The liaison process does all of the outputting to std::out but the Command Line must still wait for the Liaison to output the data before being allowed to request a new command from the user

5.9.2.2 build()

```
char * CLI::build (
            const int id,
            const std::string input )
```

Converts a std::string to a C-Style String, embeds the command id into the C-String, and pads it to length = Max↩ BufferSize

Parameters

id	File System Command ID
input	File System Command

Returns

A C-Style String of length = MaxBufferSize containing the command ID in the first X Bytes where X is the size of an integer type followed by the command itself followed by as many nullbytes as nescesarry in order to have a length = MaxBufferSize

Format user input for use by Liaison process:

1) Prepend a byte representation of the command ID to the array 2) Copy the user input into the the array (skip the first X indecies were X is the size of an integer (we don't want to overwrite the command ID))

Parameters

id	Comand ID
input	User input string

Returns

A pointer to a charachter array

5.9.2.3 run() [1/2]

```
void CLI::run (
            std::string input )
```

This function operates the same as run() but takes its input from a filestream rather than a user. Reads in the input data (A File System Command) and sends it down to the file system.
Some commands that do not need to interact with the File System code are handled in this function. For example, displaying the 'help' messages is executed from this function since the File System does not have or need and 'help' command. This function will block until it receives a response from the File System (provided that the command inputted is intended to go to the File System) this function will continue reading from the input file until an error occurs or 'end' is read in.

Parameters

input	A std::string value representing a File System command. This value is generally handed to the function by reading an input file. But may also be sent to it from another process such as a UI

5.9.2.4 run() [2/2]

```
void CLI::run ( )
```

Reads in the input data (A File System Command) and sends it down to the file system.
Some commands that do not need to interact with the File System code are handled in this function. For example, displaying the 'help' messages is executed from this function since the File System does not have or need and 'help' command. This function will block until it receives a response from the File System (provided that the command inputted is intended to go to the File System) this function will continue reading from user input until an error occurs or the user quits the application.

Reads input from user and sends it to the Liaison Process. Waits for corresponding data from the File System.

5.9.2.5 send_cmnd()

```
void CLI::send_cmnd (
             const char * cmnd )
```

Sends a command converted to a C-Style String to the Liaison Process for parsing and execution.

Parameters

command	A C-Style String of length = MaxBufferSize containing the command ID in the first X Bytes where X is the size of an integer type followed by the command itself followed by as many nullbytes as nescesarry in order to have a length = MaxBufferSize

Send user input (A filesystem command) to the Liaison Process

Parameters

cmnd	The input to send

5.9.2.6 start()

```
void CLI::start ( )
```

Performs initial set-up activities such as initiating connections and sending handshakes. Upon the completion of a successful handshake, run() is called and the interface is ready to use. If the handshake was not successful, the interface notifies the user and quits.

Run initial Command Line Interface setup operations:

1) Generate Shared Memory Segment For Process Synchronization 2) Fork And Run A Liaison Process 3) Create Sockets For Connection To Liaison 4) Send Handshake Command To File System 5) Run The Command Line

The documentation for this class was generated from the following files:

- CommandLineInterface/CLHeaders/Cli.h
- CommandLineInterface/Cli.cpp

5.10 DebugMessages Class Reference

```
#include <DebugMessages.hpp>
```

Public Member Functions

- DebugMessages ()
- DebugMessages (std::string logfile_name)
- ∼DebugMessages ()
- void ON (void)
- void OFF (void)
- template<typename T >
  void display (const T data, bool force=false)
- template<typename T >
  void log (const T data, bool force=false)
- template<typename T >
  void debug (const T data, bool force=false)
- void lock ()
- void unlock ()

5.10.1 Constructor & Destructor Documentation

5.10.1.1 DebugMessages() [1/2]

```
DebugMessages::DebugMessages ( )  [inline]
```

Create a new DebugMessage object using default logfile name: 'Arboreal.log' Automatically creates the log if it does not exist and if it does exist it will overwrite all the data in the log with the empty string. Sets the debug flag _DEBUG to FALSE on startup.

5.10.1.2 DebugMessages() [2/2]

```
DebugMessages::DebugMessages (
              std::string logfile_name )  [inline]
```

Create a new DebugMessage object using a user defined logfile name. Automatically creates the log if it does not exist and if it does exist it will overwrite all the data in the log with the empty string. Sets the debug flag _DEBUG to FALSE on startup.

5.10.1.3 ∼DebugMessages()

```
DebugMessages::∼DebugMessages ( )  [inline]
```

Default Destructor

5.10.2 Member Function Documentation

5.10.2.1 debug()

```
template<typename T >
void DebugMessages::debug (
             const T data,
             bool force = false )  [inline]
```

Template function for writing debug information to std::cout AND std::fstream.

Parameters

data	The data to be written to std::cout and a file. If the type of data passed is not supported by std::cout or outstream operators, behavior is undefined.
force	If data needs to be written before debugging offically starts this flag should be set to TRUE. Default value is FALSE.

5.10.2.2 display()

```
template<typename T >
void DebugMessages::display (
             const T data,
             bool force = false )  [inline]
```

Template function for writing debug information to std::cout ONLY.

Parameters

data	The data to be written to std::cout. If the type of data passed is not supported by std::cout, behavior is undefined.
force	If data needs to be written before debugging offically starts this flag should be set to TRUE. Default value is FALSE.

5.10.2.3 lock()

```
void DebugMessages::lock ( )  [inline]
```

5.10.2.4 log()

```
template<typename T >
void DebugMessages::log (
             const T data,
             bool force = false )  [inline]
```

Template function for writing debug information to std::fstream ONLY.

Parameters

data	The data to be written to a file. If the type of data passed is not supported by outstream operators, behavior is undefined.
force	If data needs to be written before debugging offically starts this flag should be set to TRUE. Default value is FALSE.

5.10.2.5 OFF()

```
void DebugMessages::OFF (
             void  )  [inline]
```

Turns Debugging OFF Sets _DEBUG to FALSE

5.10.2.6 ON()

```
void DebugMessages::ON (
             void  )  [inline]
```

Turns Debugging ON Sets _DEBUG to TRUE

5.10.2.7 unlock()

```
void DebugMessages::unlock ( )  [inline]
```

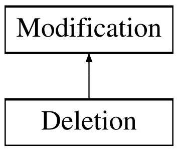
The documentation for this class was generated from the following file:

- SharedHeaders/DebugMessages.hpp

5.11 Deletion Class Reference

```
#include <Trees.h>
```

Inheritance diagram for Deletion:



Public Member Functions

- Deletion (TreeObject ∗obj, TreeObject ∗parent)
- ∼Deletion ()
- void write_out (PartitionManager ∗pm)

Additional Inherited Members

5.11.1 Constructor & Destructor Documentation

5.11.1.1 Deletion()

```
Deletion::Deletion (
         TreeObject ∗ obj,
         TreeObject ∗ parent )
```

5.11.1.2 ∼Deletion()

```
Deletion::∼Deletion ( )
```

5.11.2 Member Function Documentation

5.11.2.1 write_out()

```
void Deletion::write_out (
            PartitionManager * pm )  [virtual]
```

Implements Modification.

The documentation for this class was generated from the following files:

- Filesystem/DaemonDependancies/Trees/Trees.h
- Filesystem/DaemonDependancies/Trees/Trees.cpp

5.12 Disk Class Reference

```
#include <Disk.h>
```

Public Member Functions

- Disk (BlkNumType numblocks, size_t blockSize, char ∗location)
- ∼Disk ()

Modifier Functions

- void writeDiskBlock (BlkNumType blknum, char ∗blkdata)

Accessor Functions

- void readDiskBlock (BlkNumType blknum, char ∗blkdata)
- size_t getBlockSize ()
- int getBlockCount ()

5.12.1 Constructor & Destructor Documentation

5.12.1.1 Disk()

```
Disk::Disk (
            BlkNumType numblocks,
            size_t blockSize,
            char * location )
```

Parameters

numblocks	the number of blocks on the Disk
blocksize	the block size for Disk blocks
location	the location of the Disk

5.12.1.2 ∼Disk()

```
Disk::∼Disk ( )
```

5.12.2 Member Function Documentation

5.12.2.1 getBlockCount()

```
int Disk::getBlockCount ( )
```

Returns

the number of blocks on the entire Disk

5.12.2.2 getBlockSize()

```
size_t Disk::getBlockSize ( )
```

Returns

the blocksize of the Disk

5.12.2.3 readDiskBlock()

```
void Disk::readDiskBlock (
             BlkNumType blknum,
             char * blkdata )
```

Reads a block from the Disk.

Parameters

blknum	the blocknumber to be read
blkdata	the buffer to put the read data. must be large enough to contain an entire block of data

See also

PartitionManger::readDiskBlock() ParitionManager::readDiskBlock()

5.12.2.4 writeDiskBlock()

```
void Disk::writeDiskBlock (
            BlkNumType blknum,
            char * blkdata )
```

Writes a block to the Disk.

Parameters

blknum	the blocknumber to be written
blkdata	the buffer to write the data from. It Will write an entire block size of data.

See also

PartitionManger::writeDiskBlock() ParitionManager::writeDiskBlock()

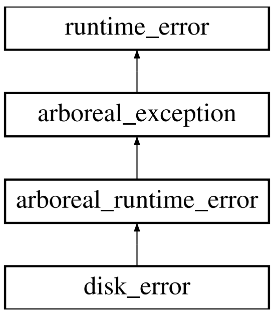
The documentation for this class was generated from the following files:

- Filesystem/DaemonDependancies/Disk/Disk.h
- Filesystem/DaemonDependancies/Disk/Disk.cpp

5.13 disk_error Class Reference

```
#include <Arboreal_Exceptions.h>
```

Inheritance diagram for disk_error:



Public Member Functions

- disk_error (const char ∗what, const char ∗where, const int ecode=99)
- disk_error (const char ∗what, const string &where, const int ecode=99)
- disk_error (const string &what, const string &where, const int ecode=99)
- disk_error (const string &what, const char ∗where, const int ecode=99)
- ∼disk_error () throw ()

Additional Inherited Members

5.13.1 Constructor & Destructor Documentation

5.13.1.1 disk_error() [1/4]

```
disk_error::disk_error (
             const char * what,
             const char * where,
             const int ecode = 99 )
```

5.13.1.2 disk_error() [2/4]

```
disk_error::disk_error (
             const char * what,
             const string & where,
             const int ecode = 99 )
```

5.13.1.3 disk_error() [3/4]

```
disk_error::disk_error (
             const string & what,
             const string & where,
             const int ecode = 99 )
```

5.13.1.4 disk_error() [4/4]

```
disk_error::disk_error (
             const string & what,
             const char * where,
             const int ecode = 99 )
```

5.13.1.5 ∼disk_error()

```
disk_error::∼disk_error ( ) throw )
```

The documentation for this class was generated from the following files:

- SharedHeaders/Arboreal_Exceptions.h
- SharedCPPFiles/Arboreal_Exceptions.cpp

5.14 DiskManager Class Reference

```
#include <DiskManager.h>
```

Public Member Functions

- DiskManager (Disk ∗d)
- ∼DiskManager ()

Accessor Functions

- void readDiskBlock (string partitionName, BlkNumType blknum, char ∗blkdata)
- size_t getBlockSize ()
- BlkNumType getPartitionSize (string partitionName)
- DiskPartition ∗ findPart (string partitionName)

Modifier Functions

- void writeDiskBlock (string partitionName, BlkNumType blknum, char ∗blkdata)

5.14.1 Constructor & Destructor Documentation

5.14.1.1 DiskManager()

```
DiskManager::DiskManager (
            Disk ∗ d )
```

Parameters

d	Pointer to the Disk this will manage

5.14.1.2 ∼DiskManager()

```
DiskManager::∼DiskManager ( )
```

5.14.2 Member Function Documentation

5.14.2.1 findPart()

```
DiskPartition ∗ DiskManager::findPart (
            string partitionName )
```

Parameters

partitionName	the name of the partition

Returns

the size of a partition in blocks

5.14.2.2 getBlockSize()

```
size_t DiskManager::getBlockSize ( )
```

Returns

the blocksize of the Disk

5.14.2.3 getPartitionSize()

```
BlkNumType DiskManager::getPartitionSize (
             string partitionName )
```

Parameters

partitionName	the name of the partition

Returns

the size of a partition in blocks

5.14.2.4 readDiskBlock()

```
void DiskManager::readDiskBlock (
             string partitionName,
             BlkNumType blknum,
             char * blkdata )
```

Reads a block from the Disk.

Parameters

partitionName	the name of the partition to write the block to
blknum	the blocknumber to be read
blkdata	the buffer to put the read data. must be large enough to contain an entire block of data

See also

PartitionManger::readDiskBlock() ParitionManager::readDiskBlock()

5.14.2.5 writeDiskBlock()

```
void DiskManager::writeDiskBlock (
             string partitionName,
             BlkNumType blknum,
             char * blkdata )
```

Writes a block to the Disk.

Parameters

partitionName	the name of the partition to write the block to
blknum	the blocknumber to be written
blkdata	the buffer to write the data from. It Will write an entire block size of data.

See also

PartitionManger::writeDiskBlock() ParitionManager::writeDiskBlock()

The documentation for this class was generated from the following files:

- Filesystem/DaemonDependancies/DiskManager/DiskManager.h
- Filesystem/DaemonDependancies/DiskManager/DiskManager.cpp

5.15 DiskPartition Struct Reference

```
#include <DiskManager.h>
```

Public Attributes

- string partitionName
- BlkNumType partitionSize
- BlkNumType partitionBlkStart
- int fileNameSize

5.15.1 Member Data Documentation

5.15.1.1 fileNameSize

```
int DiskPartition::fileNameSize
```

5.15.1.2 partitionBlkStart

```
BlkNumType DiskPartition::partitionBlkStart
```

5.15.1.3 partitionName

```
string DiskPartition::partitionName
```

5.15.1.4 partitionSize

```
BlkNumType DiskPartition::partitionSize
```

The documentation for this struct was generated from the following file:

- Filesystem/DaemonDependancies/DiskManager/DiskManager.h

5.16 File Class Reference

```
#include <File.h>
```

Public Member Functions

- File (string name, const vector< string > &tags, FileAttributes attributes)

  Accessor Functions

  - string get_name ()
  - vector< string > & get_tags ()
  - FileAttributes get_attributes ()

Static Public Member Functions

- static File ∗ read_buff (const char ∗serializedFile)

5.16.1 Constructor & Destructor Documentation

5.16.1.1 File()

```
File::File (
            string name,
            const vector< string > & tags,
            FileAttributes attributes )
```

Parameters

name	the name of the File
tags	the tags to be associated with the File
attributes	the File attributes

5.16.2 Member Function Documentation

5.16.2.1 get_attributes()

```
FileAttributes File::get_attributes ( )
```

Returns

the attributes associated with this File

5.16.2.2 get_name()

```
string File::get_name ( )
```

Returns

The name of the File

5.16.2.3 get_tags()

```
vector< string > & File::get_tags ( )
```

Returns

The tags associated with this File

5.16.2.4 read_buff()

```
File * File::read_buff (
            const char * serializedFile )  [static]
```

Will take a char∗ buffer and create a File object from it. The buffer must have been serialized in the correct format

Parameters

serializedFile	the serializedFile object

Returns

a File∗ to the created File

See also

FileInfo::serialize()

The documentation for this class was generated from the following files:

- Filesystem/DaemonDependancies/File/File.h
- Filesystem/DaemonDependancies/File/File.cpp

5.17 file_attributes Struct Reference

```
#include <types.h>
```

Public Attributes

- time_t creationTime
- time_t lastAccess
- time_t lastEdit
- size_t size
- char permissions [12]
- int owner

5.17.1 Member Data Documentation

5.17.1.1 creationTime

```
time_t file_attributes::creationTime
```

5.17.1.2 lastAccess

```
time_t file_attributes::lastAccess
```

5.17.1.3 lastEdit

```
time_t file_attributes::lastEdit
```

5.17.1.4 owner

```
int file_attributes::owner
```

5.17.1.5 permissions

```
char file_attributes::permissions[12]
```

5.17.1.6 size

```
size_t file_attributes::size
```

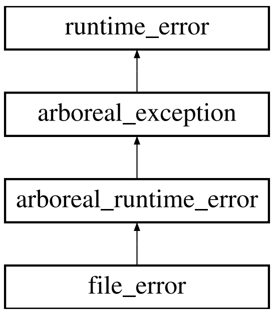
The documentation for this struct was generated from the following file:

- Filesystem/DaemonDependancies/Types/types.h

5.18 file_error Class Reference

```
#include <Arboreal_Exceptions.h>
```

Inheritance diagram for file_error:



Public Member Functions

- file_error (const char ∗what, const char ∗where, const int ecode=99)
- file_error (const char ∗what, const string &where, const int ecode=99)
- file_error (const string &what, const string &where, const int ecode=99)
- file_error (const string &what, const char ∗where, const int ecode=99)
- ∼file_error () throw ()

Additional Inherited Members

5.18.1 Constructor & Destructor Documentation

5.18.1.1 file_error() [1/4]

```
file_error::file_error (
            const char * what,
            const char * where,
            const int ecode = 99 )
```

5.18.1.2 file_error() [2/4]

```
file_error::file_error (
            const char * what,
            const string & where,
            const int ecode = 99 )
```

5.18.1.3 file_error() [3/4]

```
file_error::file_error (
            const string & what,
            const string & where,
            const int ecode = 99 )
```

5.18.1.4 file_error() [4/4]

```
file_error::file_error (
            const string & what,
            const char * where,
            const int ecode = 99 )
```

5.18.1.5 ∼file_error()

```
file_error::∼file_error ( ) throw )
```

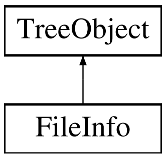
The documentation for this class was generated from the following files:

- SharedHeaders/Arboreal_Exceptions.h
- SharedCPPFiles/Arboreal_Exceptions.cpp

5.19 FileInfo Class Reference

```
#include <Trees.h>
```

Inheritance diagram for FileInfo:



Public Member Functions

- FileInfo (string filename, BlkNumType blknum, PartitionManager ∗pm)
- ∼FileInfo ()
- void write_out ()
- void read_in (unordered_multimap< string, FileInfo ∗> ∗allFiles, RootTree ∗rootTree)
- void erase (string name)
- void insert (string name, TreeObject ∗ptr)
- void del ()
- void delete_cont_blocks (BlkNumType blknum)
- void insert_addition (TreeObject ∗add)
- void insert_deletion (TreeObject ∗del)

Accessor Functions

- string mangle ()
  mangles the filename with its tags
- string mangle (vector< string > &tags)
  mangles the filename with the specified tags
- string mangle (unordered_set< string > &tags)
  mangles the filename with the specified tags
- Finode get_finode ()
- size_t get_file_size ()
- Attributes ∗ get_attributes ()
- FileAttributes get_file_attributes ()
- unordered_set< string > get_tags ()
- vector< string > get_vec_tags ()

Modifier Functions

- void add_direct_block (BlkNumType blknum, int index)
- void add_indirect_block (BlkNumType blknum, short level)
- void update_file_size (size_t bytes)
- void set_access ()
- void set_edit ()
- void set_permissions (char ∗perms)
  sets the permisssions for this file

Static Public Member Functions

- static string ∗ serialize (FileInfo ∗file)

Additional Inherited Members

5.19.1 Constructor & Destructor Documentation

5.19.1.1 FileInfo()

```
FileInfo::FileInfo (
             string filename,
             BlkNumType blknum,
             PartitionManager * pm )
```

Parameters

filename	Name of the File
blknum	the blocknumber of the associated Finode on disk

5.19.1.2 ∼FileInfo()

```
FileInfo::∼FileInfo ( )
```

5.19.2 Member Function Documentation

5.19.2.1 add_direct_block()

```
void FileInfo::add_direct_block (
             BlkNumType blknum,
             int index )
```

adds the specified blocknumber to the array of direct blocks in this file's Finode

Parameters

blknum	the block number of the direct block that has already been allocated
index	the index of the blknum in the array, must be less than 12 and at least 0.

Exceptions

arboreal_logic_error	index out of bounds

See also

add_indirect_block

5.19.2.2 add_indirect_block()

```
void FileInfo::add_indirect_block (
            BlkNumType blknum,
            short level )
```

adds the specified blocknumber to the Finode as the start of the specified level of indirect blocks

Parameters

blknum	the block number of the indirect block that has already been allocated
level	the level that the block number is associated with. must be 1, 2 or 3.

Exceptions

arboreal_logic_error	Invalid level

See also

add_direct_block

5.19.2.3 del()

```
void FileInfo::del ( )  [virtual]
```

Will completely remove the TreeObject's presence on disk

Implements TreeObject.

5.19.2.4 delete_cont_blocks()

```
void FileInfo::delete_cont_blocks (
            BlkNumType blknum )  [virtual]
```

Will follow the chain of continuation blocks and free all of them

Parameters

blknum	will free the blknum and use it to follow the chain of continuation blocks

Reimplemented from TreeObject.

5.19.2.5 erase()

```
void FileInfo::erase (
             string name )  [virtual]
```

Disassociate the given name from this object

Parameters

name	the name of the object to be erased.

Exceptions

arboreal_logic_error	

Reimplemented from TreeObject.

5.19.2.6 get_attributes()

```
Attributes * FileInfo::get_attributes ( )
```

Returns

the Attributes accociated with this file

5.19.2.7 get_file_attributes()

```
FileAttributes FileInfo::get_file_attributes ( )
```

5.19.2.8 get_file_size()

```
size_t FileInfo::get_file_size ( )
```

Returns

the size of this file in bytes

5.19.2.9 get_finode()

```
Finode FileInfo::get_finode ( )
```

Returns

the Finode associated with this file

5.19.2.10 get_tags()

```
unordered_set< string > FileInfo::get_tags ( )
```

Returns

The tags associated with this file

5.19.2.11 get_vec_tags()

```
vector< string > FileInfo::get_vec_tags ( )
```

5.19.2.12 insert()

```
void FileInfo::insert (
             string name,
             TreeObject * obj )  [virtual]
```

Associate a TreeObject with this object

Parameters

name	name of the object, mangled if inserting a FileInfo
obj	the object to be inserted

Exceptions

tag_error	

See also

FileInfo::insert()

Reimplemented from TreeObject.

5.19.2.13 insert_addition()

```
void FileInfo::insert_addition (
            TreeObject * add )  [virtual]
```

Do not call on FileInfo

Reimplemented from TreeObject.

5.19.2.14 insert_deletion()

```
void FileInfo::insert_deletion (
            TreeObject * del )  [virtual]
```

Do not call on FileInfo

Reimplemented from TreeObject.

5.19.2.15 mangle() [1/3]

```
string FileInfo::mangle ( )
```

mangles the filename with its tags

The name is mangled as follows: Each tag is placed in alphabetical order and appended to the filename using '_' as the seperator.

Returns

the mangled name of this file.

See also

mangle(vector<string>&) mangle(unordered_set<string>& tags)

5.19.2.16 mangle() [2/3]

```
string FileInfo::mangle (
            vector< string > & tags )
```

mangles the filename with the specified tags

The name is mangled as follows: Each tag is placed in alphabetical order and appended to the filename using '_' as the seperator.

Returns

the mangled name of this file.

Parameters

tags	the tags you wish to mangle the filename with

See also

mangle() mangle(unordered_set<string>& tags)

5.19.2.17 mangle() [3/3]

```
string FileInfo::mangle (
            unordered_set< string > & tags )
```

mangles the filename with the specified tags

) The name is mangled as follows: Each tag is placed in alphabetical order and appended to the filename using '_' as the seperator.

Returns

the mangled name of this file.

Parameters

tags	the tags you wish to mangle the filename with

See also

mangle() mangle(unordered_set<string>& tags

5.19.2.18 read_in()

```
void FileInfo::read_in (
            unordered_multimap< string, FileInfo *> * allFiles,
            RootTree * rootTree ) [virtual]
```

Will read in all object data from disk

Parameters

allFiles	a pointer to the map of all files
rootTree	a pointer to the root tree

Implements TreeObject.

5.19.2.19 serialize()

```
string * FileInfo::serialize (
            FileInfo * file )  [static]
```

Will serialize a FileInfo object such that it can be read in as a File object

Parameters

file	the FileInfo object to be serialized

Returns

The serialized object in string form

See also

File::read_buff()

5.19.2.20 set_access()

```
void FileInfo::set_access ( )
```

marks the file as accessed at the current UNIX time

5.19.2.21 set_edit()

```
void FileInfo::set_edit ( )
```

marks the file as edited at the current UNIX time

5.19.2.22 set_permissions()

```
void FileInfo::set_permissions (
            char * perms )
```

sets the permisssions for this file

The permisssions format is as follows. a 1 for true 0 false Byte 0, 1, 2 : reserved, for now Byte 3 - 5 : read write and execute permisssions for the user Byte 6 - 8 : read write and execute permisssions for the group Byte 9 - 11 : read write and execute permisssions for the world Currently there is no differentiation between user group and world

Parameters

perms	the permisssions in the correct format

5.19.2.23 update_file_size()

```
void FileInfo::update_file_size (
            size_t bytes )
```

Sets the file size to the specified bytes. Only the filesystem should call.

Parameters

bytes	the new file size

5.19.2.24 write_out()

```
void FileInfo::write_out ( )  [virtual]
```

Intended to write out the object to disk

Implements TreeObject.

The documentation for this class was generated from the following files:

- Filesystem/DaemonDependancies/Trees/Trees.h
- Filesystem/DaemonDependancies/Trees/Trees.cpp

5.20 FileOpen Class Reference

```
#include <FileSystem.h>
```

Public Member Functions

- FileOpen (FileInfo ∗file, char mode, PartitionManager ∗pm)
- FileInfo ∗ get_file ()
- size_t get_seek ()
- char get_mode ()
- void increment_seek (size_t bytes, bool write=false)
- void decrement_seek (size_t bytes)
- Index byte_to_index (short offset)
- Index increment_index ()
- void set_EOF ()
- void reset_seek ()
- bool get_EOF ()
- void go_past_last_byte ()
- void refresh ()

5.20.1 Constructor & Destructor Documentation

5.20.1.1 FileOpen()

```
FileOpen::FileOpen (
             FileInfo * file,
             char mode,
             PartitionManager * pm )
```

5.20.2 Member Function Documentation

5.20.2.1 byte_to_index()

```
Index FileOpen::byte_to_index (
             short offset )
```

5.20.2.2 decrement_seek()

```
void FileOpen::decrement_seek (
             size_t bytes )
```

5.20.2.3 get_EOF()

```
bool FileOpen::get_EOF ( )
```

5.20.2.4 get_file()

```
FileInfo * FileOpen::get_file ( )
```

5.20.2.5 get_mode()

```
char FileOpen::get_mode ( )
```

5.20.2.6 get_seek()

```
size_t FileOpen::get_seek ( )
```

5.20.2.7 go_past_last_byte()

```
void FileOpen::go_past_last_byte ( )
```

5.20.2.8 increment_index()

```
Index FileOpen::increment_index ( )
```

5.20.2.9 increment_seek()

```
void FileOpen::increment_seek (
             size_t bytes,
             bool write = false )
```

5.20.2.10 refresh()

```
void FileOpen::refresh ( )
```

5.20.2.11 reset_seek()

```
void FileOpen::reset_seek ( )
```

5.20.2.12 set_EOF()

```
void FileOpen::set_EOF ( )
```

The documentation for this class was generated from the following files:

- Filesystem/DaemonDependancies/FileSystem/FileSystem.h
- Filesystem/DaemonDependancies/FileSystem/FileSystem.cpp

5.21 FileSystem Class Reference

```
#include <FileSystem.h>
```

Public Member Functions

- FileSystem (DiskManager ∗dm, string partitionName)
- ∼FileSystem ()
- void write_changes ()
- FileInfo ∗ path_to_file (vector< string > &path)
- int get_file_name_size ()
- size_t num_of_files ()
- size_t num_of_tags ()

Tag Operations

- vector< FileInfo ∗ > ∗ tag_search (unordered_set< string > &tags)
- void create_tag (string tagName)
- void delete_tag (string tagName)
- void merge_tags (string tag1, string tag2)
- void tag_file (FileInfo ∗file, unordered_set< string > tagsToAdd)
- void tag_file (vector< string > &filePath, unordered_set< string > tags)
- void untag_file (FileInfo ∗file, unordered_set< string > tagsToRemove, bool deleting=false)
- void untag_file (vector< string > &filePath, unordered_set< string > tags)
- void rename_tag (string originalTagName, string newTagName)

File Operations

- vector< FileInfo ∗ > ∗ file_search (string name)
- FileInfo ∗ create_file (string filename, unordered_set< string > &tags)
- int open_file (vector< string > &filePath, char mode)
- void close_file (unsigned int fileDesc)
- size_t read_file (unsigned int fileDesc, char ∗data, size_t len)
- size_t write_file (unsigned int fileDesc, const char ∗data, size_t len)
- size_t append_file (unsigned int fileDesc, const char ∗data, size_t len)
- void seek_file_absolute (unsigned int fileDesc, size_t offset)
- void seek_file_relative (unsigned int fileDesc, long int offset)
- void rename_file (vector< string > &originalFilePath, string newFileName)
- Attributes ∗ get_attributes (vector< string > &filePath)
- void set_permissions (vector< string > &filePath, char ∗perms)
- void delete_file (FileInfo ∗file)
- void delete_file (vector< string > &filePath)

Debug Functions

- void print_root ()
- void print_tags ()
- void print_files ()

5.21.1 Constructor & Destructor Documentation

5.21.1.1 FileSystem()

```
FileSystem::FileSystem (
            DiskManager ∗ dm,
            string partitionName )
```

Parameters

dm	the Disk manager for the disk that this Filesystem will be accessing
partitionName	the name of the partition that this FileSystem will be associated with

5.21.1.2 ∼FileSystem()

```
FileSystem::∼FileSystem ( )
```

5.21.2 Member Function Documentation

5.21.2.1 append_file()

```
size_t FileSystem::append_file (
             unsigned int fileDesc,
             const char * data,
             size_t len )
```

Will Append a number of bytes to an open file. The file must have been opened with write permissions.

Parameters

fileDesc	the file descriptor returned from open_file
data	a buffer to be read from to write to the file. must be at least of len size
len	the number of bytes to write from data.

5.21.2.2 close_file()

```
void FileSystem::close_file (
             unsigned int fileDesc )
```

Will close a file. the File must have been opened.

Parameters

fileDesc	the file descriptor returned from open_file

5.21.2.3 create_file()

```
FileInfo * FileSystem::create_file (
             string filename,
             unordered_set< string > & tags )
```

Will create a new file with the specified name and tags. The new file must not already exist.

Parameters

filename	the name of the new file
tags	the tag set to tag the file with. If empty, will be tagged with default.

Returns

a FileInfo to the created file, in case the calling code needs it

5.21.2.4 create_tag()

```
void FileSystem::create_tag (
             string tagName )
```

Will create a new tag if that tag name does not already exist

Parameters

tagName	the name of the Tag to create

5.21.2.5 delete_file() [1/2]

```
void FileSystem::delete_file (
             FileInfo * file )
```

Delete a particular file. The file must exist.

Parameters

file	the FileInfo object to be deleted.

See also

delete_file(vector<string>&)

5.21.2.6 delete_file() [2/2]

```
void FileSystem::delete_file (
             vector< string > & filePath )
```

Delete a particular file. The file must exist.

Parameters

filePath	the full path to the file to you wish to delete

See also

delete_file(FileInfo∗)

5.21.2.7 delete_tag()

```
void FileSystem::delete_tag (
             string tagName )
```

Will delete the specified tag only if it has no files associated with it(it is empty) and it does in fact exist.

Parameters

tagName	the name of the tag to be deleted

5.21.2.8 file_search()

```
vector< FileInfo * > * FileSystem::file_search (
             string name )
```

Will search for a specified file name. Searches the entire FileSystem

Parameters

name	the name of the file to search for.

Returns

a pointer to a vector of FileInfo objects that have the specified name. This should be freed by the calling code

5.21.2.9 get_attributes()

```
Attributes * FileSystem::get_attributes (
             vector< string > & filePath )
```

Will search for a file and return its Attributes

Parameters

filePath	the full path to the file to you wish to get the Attributes of

Returns

the Attributes object associated with a particular file.

5.21.2.10 get_file_name_size()

```
int FileSystem::get_file_name_size ( )
```

Returns

the Maximum file name size for the partition associated with this FileSystem object

5.21.2.11 merge_tags()

```
void FileSystem::merge_tags (
             string tag1,
             string tag2 )
```

TODO: description and Function

Parameters

tag1	
tag	2

5.21.2.12 num_of_files()

```
size_t FileSystem::num_of_files ( )
```

5.21.2.13 num_of_tags()

```
size_t FileSystem::num_of_tags ( )
```

5.21.2.14 open_file()

```
int FileSystem::open_file (
            vector< string > & filePath,
            char mode )
```

Will open a file. The file must exist. There is a cap on the Maximum number of open files. You can open the same file as many times as you want.

Parameters

filePath	the full path including the file name as the last entry
mode	the mode to open the file with. r, w, or x. x is read and write ability.

Returns

a file descriptor that can later be used to reference the opened file

5.21.2.15 path_to_file()

```
FileInfo * FileSystem::path_to_file (
            vector< string > & path )
```

Will find a FileInfo object if it exists, given the full path

Parameters

path	The full path to the file. The filename must be the last entry in the vector. an file name with no path is considered to be in the default path

Returns

the found FileInfo object

5.21.2.16 print_files()

```
void FileSystem::print_files ( )
```

Print out all files and their blocknumbers

5.21.2.17 print_root()

```
void FileSystem::print_root ( )
```

Print out the root Tree

5.21.2.18 print_tags()

```
void FileSystem::print_tags ( )
```

Print out all the tag trees and their contents

5.21.2.19 read_file()

```
size_t FileSystem::read_file (
             unsigned int fileDesc,
             char * data,
             size_t len )
```

Will read a number of bytes from an open file. The file must have been opened with read permissions. If you read past the end of the file, EOF will be tripped and you cannot continue reading. will return all the data up to that point

Parameters

fileDesc	the file descriptor returned from open_file
data	a buffer to store the read data must be at least len size
len	the number of bytes to read.

5.21.2.20 rename_file()

```
void FileSystem::rename_file (
             vector< string > & originalFilePath,
             string newFileName )
```

Will rename a file. The new file must not already exist in the emulated directory

Parameters

originalFilePath	the full path to the file to be renamed
newFileName	the name that the file will be renamed to.

5.21.2.21 rename_tag()

```
void FileSystem::rename_tag (
             string originalTagName,
             string newTagName )
```

Will rename the tag. The tag must exist. The new tag name must already exist. This is a slow operation.

Parameters

originalTagName	the name of the tag to be renamed
newTagName	the new tag name for that tag

5.21.2.22 seek_file_absolute()

```
void FileSystem::seek_file_absolute (
             unsigned int fileDesc,
             size_t offset )
```

Seek to an absolute position in the file. Will trip EOF if the offset is larger than the file size. The posistion in the file is indexed at 1.

Parameters

fileDesc	the file descriptor returned from open_file
offset	the absolute position in the file to seek to.

5.21.2.23 seek_file_relative()

```
void FileSystem::seek_file_relative (
             unsigned int fileDesc,
             long int offset )
```

Seek to a relative position in the file. Will trip EOF if you try to seek too far in a direction. The posistion in the file is indexed at 1.

Parameters

fileDesc	the file descriptor returned from open_file
offset	the relative position in the file to seek to. may be a negative number.

5.21.2.24 set_permissions()

```
void FileSystem::set_permissions (
             vector< string > & filePath,
             char * perms )
```

Set the permissions for a file. The format is defined in FileInfo.

Parameters

filePath	the full path to the file to you wish to get the Attributes of
perms	the permissions following the correct format to set to this file

See also

FileInfo::set_permissions()

5.21.2.25 tag_file() [1/2]

```
void FileSystem::tag_file (
            FileInfo * file,
            unordered_set< string > tagsToAdd )
```

Will tag a file with the specified tags. If some or all of the tags do not exist, a warning is printed and the operation continues. The file must exist. The file that would be created by adding tags must not already exist.

Parameters

file	the FileInfo∗ that will be tagged with the specified tags
tagsToAdd	the tags that will be added to the file's tag set

See also

tag_file(vector<string>&, unordered_set<string>)

5.21.2.26 tag_file() [2/2]

```
void FileSystem::tag_file (
            vector< string > & filePath,
            unordered_set< string > tags )
```

An alternate way to tag a file using a file path instead.Will tag a file with the specified tags. If some or all of the tags do not exist, a warning is printed and the operation continues. The file must exist. The file that would be created by adding tags must not already exist.

Parameters

filePath	the FileInfo∗ that will be tagged with the specified tags
tagsToAdd	the tags that will be added to the file's tag set

See also

tag_file(FileInfo∗, unordered_set<string>)

5.21.2.27 tag_search()

```
vector< FileInfo * > * FileSystem::tag_search (
             unordered_set< string > & tags )
```

Search for files by tags. The tag search is an "and" operation, meaning the files returned will have at least all the specified tags.

Parameters

tags	the tags that the files will be tagged with in the return vector

Returns

a pointer to a vector of the FileInfo objects which then can be serialized. The returned vector should be freed by the calling code

5.21.2.28 untag_file() [1/2]

```
void FileSystem::untag_file (
             FileInfo * file,
             unordered_set< string > tagsToRemove,
             bool deleting = false )
```

Will remove tags associated with the specified file. The tags must exist. The file must exist. The file that would be created by removing tags must not already exist.

Parameters

file	the FileInfo∗ that will be untagged with the specified tags
tagsToRemove	the tags that will be removed from the file's tag set
deleting	this is a tag only used by the FileSystem itself for deleting a file

See also

tag_file(FileInfo∗, unordered_set<string>)

5.21.2.29 untag_file() [2/2]

```
void FileSystem::untag_file (
            vector< string > & filePath,
            unordered_set< string > tags )
```

Will remove tags associated with the specified file. The tags must exist. The file must exist. The file that would be created by removing tags must not already exist.

Parameters

file	the FileInfo∗ that will be untagged with the specified tags
tagsToRemove	the tags that will be removed from the file's tag set
deleting	this is a tag only used by the FileSystem itself for deleting a file

See also

tag_file(FileInfo∗, unordered_set<string>)

5.21.2.30 write_changes()

```
void FileSystem::write_changes ( )
```

Since the FileSystem is journaling. The changes to tag trees and the Root tree are only written out when this is called. File Operations are not journaled.

5.21.2.31 write_file()

```
size_t FileSystem::write_file (
            unsigned int fileDesc,
            const char * data,
            size_t len )
```

Will write a number of bytes to an open file. The file must have been opened with write permissions. You can write past the EOF with no problems.

Parameters

fileDesc	the file descriptor returned from open_file
data	a buffer to be read from to write to the file. must be at least of len size
len	the number of bytes to write from data.

The documentation for this class was generated from the following files:

- Filesystem/DaemonDependancies/FileSystem/FileSystem.h
- Filesystem/DaemonDependancies/FileSystem/FileSystem.cpp

5.22 finode Struct Reference

```
#include <types.h>
```

Public Attributes

- BlkNumType attributes
- BlkNumType directBlocks [12]
- BlkNumType level1Indirect
- BlkNumType level2Indirect
- BlkNumType level3Indirect

5.22.1 Member Data Documentation

5.22.1.1 attributes

```
BlkNumType finode::attributes
```

5.22.1.2 directBlocks

```
BlkNumType finode::directBlocks[12]
```

5.22.1.3 level1Indirect

```
BlkNumType finode::level1Indirect
```

5.22.1.4 level2Indirect

```
BlkNumType finode::level2Indirect
```

5.22.1.5 level3Indirect

```
BlkNumType finode::level3Indirect
```

The documentation for this struct was generated from the following file:

- Filesystem/DaemonDependancies/Types/types.h

5.23 index Struct Reference

```
#include <types.h>
```

Public Attributes

- BlkNumType blknum
- size_t offset

5.23.1 Member Data Documentation

5.23.1.1 blknum

```
BlkNumType index::blknum
```

5.23.1.2 offset

```
size_t index::offset
```

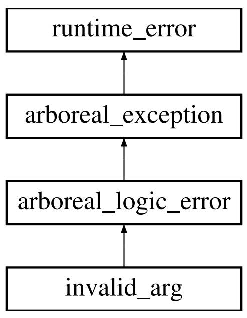
The documentation for this struct was generated from the following file:

- Filesystem/DaemonDependancies/Types/types.h

5.24 invalid_arg Class Reference

```
#include <Arboreal_Exceptions.h>
```

Inheritance diagram for invalid_arg:



Public Member Functions

- invalid_arg (const char ∗what, const char ∗where, const int ecode=99)
- invalid_arg (const char ∗what, const string &where, const int ecode=99)
- invalid_arg (const string &what, const string &where, const int ecode=99)
- invalid_arg (const string &what, const char ∗where, const int ecode=99)
- ∼invalid_arg () throw ()

Additional Inherited Members

5.24.1 Constructor & Destructor Documentation

5.24.1.1 invalid_arg() [1/4]

```
invalid_arg::invalid_arg (
             const char * what,
             const char * where,
             const int ecode = 99 )
```

5.24.1.2 invalid_arg() [2/4]

```
invalid_arg::invalid_arg (
             const char * what,
             const string & where,
             const int ecode = 99 )
```

5.24.1.3 invalid_arg() [3/4]

```
invalid_arg::invalid_arg (
             const string & what,
             const string & where,
             const int ecode = 99 )
```

5.24.1.4 invalid_arg() [4/4]

```
invalid_arg::invalid_arg (
             const string & what,
             const char * where,
             const int ecode = 99 )
```

5.24.1.5 ∼invalid_arg()

```
invalid_arg::∼invalid_arg ( ) throw )
```

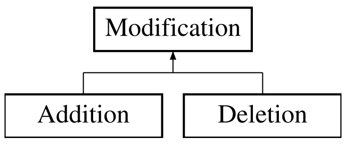
The documentation for this class was generated from the following files:

- SharedHeaders/Arboreal_Exceptions.h
- SharedCPPFiles/Arboreal_Exceptions.cpp

5.25 Modification Class Reference

```
#include <Trees.h>
```

Inheritance diagram for Modification:



Public Member Functions

- virtual ∼Modification ()
- virtual void write_out (PartitionManager ∗pm)=0

Protected Member Functions

- Modification (TreeObject ∗obj, TreeObject ∗parent)

Protected Attributes

- TreeObject ∗ _mod
- TreeObject ∗ _parent

5.25.1 Constructor & Destructor Documentation

5.25.1.1 Modification()

```
Modification::Modification (
            TreeObject ∗ obj,
            TreeObject ∗ parent )   [protected]
```

5.25.1.2 ∼Modification()

```
Modification::∼Modification ( )  [virtual]
```

5.25.2 Member Function Documentation

5.25.2.1 write_out()

```
virtual void Modification::write_out (
             PartitionManager * pm )  [pure virtual]
```

Implemented in Deletion, and Addition.

5.25.3 Member Data Documentation

5.25.3.1 _mod

```
TreeObject* Modification::_mod  [protected]
```

5.25.3.2 _parent

```
TreeObject* Modification::_parent  [protected]
```

The documentation for this class was generated from the following files:

- Filesystem/DaemonDependancies/Trees/Trees.h
- Filesystem/DaemonDependancies/Trees/Trees.cpp

5.26 ParseError Class Reference

```
#include <Parser.h>
```

Public Member Functions

- ParseError (const char ∗where, const char ∗what)
- std::string where ()
- std::string what ()

5.26.1 Constructor & Destructor Documentation

5.26.1.1 ParseError()

```
ParseError::ParseError (
             const char * where,
             const char * what )  [inline]
```

Parameters

where	Where the parse error took place
what	What the parse error consisted of

5.26.2 Member Function Documentation

5.26.2.1 what()

```
std::string ParseError::what ( )  [inline]
```

Returns

A std::string detailing what the parse error consisted of

5.26.2.2 where()

```
std::string ParseError::where ( )  [inline]
```

Returns

A std::string detailing where the parse error occured

The documentation for this class was generated from the following file:

- SharedHeaders/Parser.h

5.27 Parser Class Reference

```
#include <Parser.h>
```

Public Member Functions

- Parser (char ∗buffer, char ∗cwd, int max_name_size)
- Parser (std::string string, std::string cwd, int max_name_size)
- Parser (const char ∗string_lit, const char ∗cwd, int max_name_size)
- Parser ()
- ∼Parser ()
- void reset (std::string string, std::string cwd="")

  Changes the member _string of the parser class to whatever is passed.
- void reset (char ∗buffer, char ∗cwd=NULL)

  Changes the member _string of the parser class to whatever is passed.
- void reset (const char ∗string_lit, const char ∗cwd="")

  Changes the member _string of the parser class to whatever is passed.
- void set_max_name_size (int size)

  Sets the maximum allowed file and tagname size that the Parser will use.
- void set_cwd (std::string cwd)

  Sets the Current Working Directory that the Parser will use.
- std::vector< std::string > parse (int type)

  Parse a string based on a certain rule.
- std::vector< std::string > get_cwd_tags ()

  Returns a vector representation of the current working directory.

Static Public Member Functions

- static std::vector< std::string > split_on_delim (std::string string, char delim)

  Splits a string at each instance of a particualar char (the delimeter)

5.27.1 Constructor & Destructor Documentation

5.27.1.1 Parser() [1/4]

```
Parser::Parser (
             char * buffer,
             char * cwd,
             int max_name_size )
```

Parameters

buffer	A C-Style String representation of the string to be parsed
cwd	A C-Style String representation of the current working directory; (This value is typically provided by the Liaison process). The directory string is used to parse commands which act within directories only thus providing commands such as 'tag' a "path" to the file(s) which will be tagged without the user having to explicitly enter those file's entire paths themselves.
max_name_size	The maximum length that a file or tagname is allowed to have; (This value is typically provided by the Liaison process)

5.27.1.2 Parser() [2/4]

```
Parser::Parser (
            std::string string,
            std::string cwd,
            int max_name_size )
```

Parameters

buffer	A std::string representation of the string to be parsed
cwd	A std::string representation of the current working directory; (This value is typically provided by the Liaison process). The directory string is used to parse commands which act within directories only thus, providing commands such as 'tag' a "path" to the file(s) which will be tagged without the user having to explicitly enter those file's entire paths themselves.
max_name_size	The maximum length that a file or tagname is allowed to have; (This value is typically provided by the Liaison process)

5.27.1.3 Parser() [3/4]

```
Parser::Parser (
            const char * string_lit,
            const char * cwd,
            int max_name_size )
```

Parameters

buffer	A String Literal representation of the string to be parsed
cwd	A String Literal representation of the current working directory; (This value is typically provided by the Liaison process). The directory string is used to parse commands which act within directories only thus, providing commands such as 'tag' a "path" to the file(s) which will be tagged without the user having to explicitly enter those file's entire paths themselves.
max_name_size	The maximum length that a file or tagname is allowed to have; (This value is typically provided by the Liaison process)

5.27.1.4 Parser() [4/4]

```
Parser::Parser ( )
```

Default Constructor to be used in case initialization of values needs to be done elsewhere

5.27.1.5 ∼Parser()

```
Parser::∼Parser ( )
```

Default Destructor; Does nothing

5.27.2 Member Function Documentation

5.27.2.1 get_cwd_tags()

```
std::vector< std::string > Parser::get_cwd_tags ( )
```

Returns a vector representation of the current working directory.

That is, it will decompose '/string1/string2' into a vector containing [string1, string2]. This is useful when the calling code requires the current working directory as a vector of strings rather than as a standard string representation.

Returns

A std::vector of std::string comprised of the non-'/' parts of the Parser member value _cwd

5.27.2.2 parse()

```
std::vector< std::string > Parser::parse (
            int type )
```

Parse a string based on a certain rule.

The rule generally corresponds to how a CLI command should be decomposed.
For example the CLI command for finding files takes a list of files, hower the filesystem itself does not support batch commands, therefore, the Parser will decompose the command into its constituent parts (i.e. a single file).
This particular behavior is access by passing '8' as the "type" of decomposition that needs to take place (Note that this corresponds to the command's ID).
However the Parser can be extended to support any rule whatsoever, so long as it is added to the Parser's parse() function switch statement.

Parameters

type	The integer identification of the parse rule that will be executed

Returns

A std::vector of std::string comprised of the result after the chosen parse rule is executed.

5.27.2.3 reset() [1/3]

```
void Parser::reset (
            std::string string,
            std::string cwd = "" )
```

Changes the member _string of the parser class to whatever is passed.

The Parser class conducts all operations on its member _string rather than requiring that a string value be passed to its parse() method. This was done in order to make use of the class as streamlined as possible.

Parameters

string	A std::string representation of the string to be parsed
cwd	A std::string representation of the current working directory; Note that this argument is optional and allows the user to both reset the string the Parser will work with as well as the directory string the Parser will use. The directory string is used to parse commands which act within directories only thus providing commands such as 'tag' a "path" to the file(s) which will be tagged without the user having to explicitly enter those file's entire paths themselves.

5.27.2.4 reset() [2/3]

```
void Parser::reset (
             char * buffer,
             char * cwd = NULL )
```

Changes the member _string of the parser class to whatever is passed.

The Parser class conducts all operations on its member _string rather than requiring that a string value be passed to its parse() method. This was done in order to make use of the class as streamlined as possible.

Parameters

string	A C-Style String representation of the string to be parsed
cwd	A C-Style String representation of the current working directory; Note that this argument is optional and allows the user to both reset the string the Parser will work with as well as the directory string the Parser will use. The directory string is used to parse commands which act within directories only thus providing commands such as 'tag' a "path" to the file(s) which will be tagged without the user having to explicitly enter those file's entire paths themselves.

Returns

Void

5.27.2.5 reset() [3/3]

```
void Parser::reset (
             const char * string_lit,
             const char * cwd = "" )
```

Changes the member _string of the parser class to whatever is passed.

The Parser class conducts all operations on its member _string rather than requiring that a string value be passed to its parse() method. This was done in order to make use of the class as streamlined as possible.

Parameters

string	A String Literal representation of the string to be parsed
cwd	A String Literal representation of the current working directory; Note that this argument is optional and allows the user to both reset the string the Parser will work with as well as the directory string the Parser will use. The directory string is used to parse commands which act within directories only thus providing commands such as 'tag' a "path" to the file(s) which will be tagged without the user having to explicitly enter those file's entire paths themselves.

Returns

Void

5.27.2.6 set_cwd()

```
void Parser::set_cwd (
             std::string cwd )
```

Sets the Current Working Directory that the Parser will use.

The directory string is used to parse commands which act within directories only thus providing commands such as 'tag' a "path" to the file(s) which will be tagged without the user having to explicitly enter those file's entire paths themselves. This function does not have counterparts which tahe C-Style Strings or String Literals. This is because, in all situations, if the current working directory must be set using this method, it is highly likely that the calling code has a std::string representation of the current working directory rather than a representation in one of the other formats. If such functionality (C-Style Strings and others) is desired, extensibility is easy enough. Regardless the Parser's _cwd member will always be a std::string.

Parameters

cwd	A std::string representation of the current working directory

Returns

Void

5.27.2.7 set_max_name_size()

```
void Parser::set_max_name_size (
             int size )
```

Sets the maximum allowed file and tagname size that the Parser will use.

If this size is exceeded an error is thrown and the Parser will stop its current activities. This value is dictated by the CLI and is generally provided to the Parser by the Liaison Process.

Parameters

size	The maximum file/tag name length

5.27.2.8 split_on_delim()

```
std::vector< std::string > Parser::split_on_delim (
            std::string string,
            char delim )  [static]
```

Splits a string at each instance of a particualar char (the delimeter)

The delimeters are NOT included anywhere in the resulting vector. This function is static and is mainly used outside the Parser in order to split values that the parser returned. This can happen because the complexity of certain commands does not allow the parser to fully decompose the string and instead it can only reorganize the command into a form which can be easily split later. It is important to note that this function does not differentiate between the number of delimeter charcters the string contains. That is, it will read the whole string and split it at any point where the delimeter is seen whether it is seen in 1 or 100 places.

Parameters

string	A std::string representation of whatever string needs to be split
delim	A char value representing where the string should be split

The documentation for this class was generated from the following files:

- SharedHeaders/Parser.h
- SharedCPPFiles/Parser.cpp

5.28 PartitionManager Class Reference

```
#include <PartitionManager.h>
```

Public Member Functions

- PartitionManager (DiskManager ∗dm, string partitionName)
- ∼PartitionManager ()

Accessor Functions

- void readDiskBlock (BlkNumType blknum, char ∗blkdata)
- size_t getBlockSize ()
- string getPartitionName ()
- int get_file_name_size ()

Modifier Functions

- void writeDiskBlock (BlkNumType blknum, char ∗blkdata)
- BlkNumType getFreeDiskBlock ()
- void returnDiskBlock (BlkNumType blknum)

5.28.1 Constructor & Destructor Documentation

5.28.1.1 PartitionManager()

```
PartitionManager::PartitionManager (
             DiskManager * dm,
             string partitionName )
```

Parameters

dm	the DiskManager associated with this object
partitionName	the name of the partition that this will be managing

5.28.1.2 ~PartitionManager()

```
PartitionManager::~PartitionManager ( )
```

5.28.2 Member Function Documentation

5.28.2.1 get_file_name_size()

```
int PartitionManager::get_file_name_size ( )
```

Returns

The maximum file name size for this partition in bytes

5.28.2.2 getBlockSize()

```
size_t PartitionManager::getBlockSize ( )
```

Returns

the blocksize of the Disk

5.28.2.3 getFreeDiskBlock()

```
BlkNumType PartitionManager::getFreeDiskBlock ( )
```

Allocates a block on disk if there is a free one. The Disk free list is updated accordingly

Returns

the block number of the newly allocated block

5.28.2.4 getPartitionName()

```
string PartitionManager::getPartitionName ( )
```

Returns

The name of the partition this PartitionManager is associated with

5.28.2.5 readDiskBlock()

```
void PartitionManager::readDiskBlock (
            BlkNumType blknum,
            char * blkdata )
```

Reads a block from the Disk.

Parameters

blknum	the blocknumber to be read
blkdata	the buffer to put the read data. must be large enough to contain an entire block of data

5.28.2.6 returnDiskBlock()

```
void PartitionManager::returnDiskBlock (
            BlkNumType blknum )
```

returns a block to the Disk free list and zeros it out before writing.

Parameters

blknum	the blocknumber of the block to be freed

5.28.2.7 writeDiskBlock()

```
void PartitionManager::writeDiskBlock (
            BlkNumType blknum,
            char * blkdata )
```

Writes a block to the Disk.

Parameters

blknum	the blocknumber to be written
blkdata	the buffer to write the data from. It Will write an entire block size of data.

The documentation for this class was generated from the following files:

- Filesystem/DaemonDependancies/PartitionManager/PartitionManager.h
- Filesystem/DaemonDependancies/PartitionManager/PartitionManager.cpp

5.29 rootSuperBlock Struct Reference

```
#include <types.h>
```

Public Attributes

- size_t size
- Index lastEntry
- BlkNumType startBlock

5.29.1 Member Data Documentation

5.29.1.1 lastEntry

```
Index rootSuperBlock::lastEntry
```

5.29.1.2 size

```
size_t rootSuperBlock::size
```

5.29.1.3 startBlock

```
BlkNumType rootSuperBlock::startBlock
```

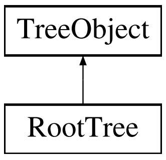
The documentation for this struct was generated from the following file:

- Filesystem/DaemonDependancies/Types/types.h

5.30 RootTree Class Reference

```
#include <Trees.h>
```

Inheritance diagram for RootTree:



Public Member Functions

- RootTree (PartitionManager ∗pm)
- ∼RootTree ()
- void write_out ()
- void read_in (unordered_multimap< string, FileInfo ∗> ∗allFiles, RootTree ∗rootTree)
- void del ()

Additional Inherited Members

5.30.1 Constructor & Destructor Documentation

5.30.1.1 RootTree()

```
RootTree::RootTree (
            PartitionManager ∗ pm )
```

Parameters

pm	the PartitionManager to be associated with the RootTree

5.30.1.2 ∼RootTree()

```
RootTree::∼RootTree ( )
```

5.30.2 Member Function Documentation

5.30.2.1 del()

```
void RootTree::del ( )  [virtual]
```

Will completely remove the TreeObject's presence on disk

Implements TreeObject.

5.30.2.2 read_in()

```
void RootTree::read_in (
            unordered_multimap< string, FileInfo *> * allFiles,
            RootTree * rootTree )  [virtual]
```

Will read in all object data from disk

Parameters

allFiles	a pointer to the map of all files
rootTree	a pointer to the root tree

Implements TreeObject.

5.30.2.3 write_out()

```
void RootTree::write_out ( )  [virtual]
```

Intended to write out the object to disk

Implements TreeObject.

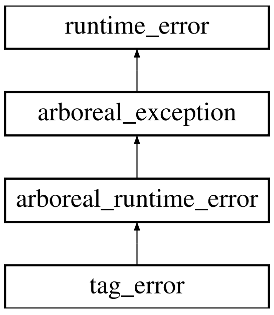
The documentation for this class was generated from the following files:

- Filesystem/DaemonDependancies/Trees/Trees.h
- Filesystem/DaemonDependancies/Trees/Trees.cpp

5.31 tag_error Class Reference

```
#include <Arboreal_Exceptions.h>
```

Inheritance diagram for tag_error:



Public Member Functions

- tag_error (const char ∗what, const char ∗where, const int ecode=99)
- tag_error (const char ∗what, const string &where, const int ecode=99)
- tag_error (const string &what, const string &where, const int ecode=99)
- tag_error (const string &what, const char ∗where, const int ecode=99)
- ∼tag_error () throw ()

Additional Inherited Members

5.31.1 Constructor & Destructor Documentation

5.31.1.1 tag_error() [1/4]

```
tag_error::tag_error (
            const char * what,
            const char * where,
            const int ecode = 99 )
```

5.31.1.2 tag_error() [2/4]

```
tag_error::tag_error (
            const char * what,
            const string & where,
            const int ecode = 99 )
```

5.31.1.3 tag_error() [3/4]

```
tag_error::tag_error (
              const string & what,
              const string & where,
              const int ecode = 99 )
```

5.31.1.4 tag_error() [4/4]

```
tag_error::tag_error (
              const string & what,
              const char * where,
              const int ecode = 99 )
```

5.31.1.5 ∼tag_error()

```
tag_error::∼tag_error ( ) throw )
```

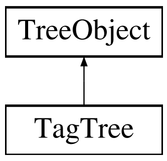
The documentation for this class was generated from the following files:

- SharedHeaders/Arboreal_Exceptions.h
- SharedCPPFiles/Arboreal_Exceptions.cpp

5.32 TagTree Class Reference

```
#include <Trees.h>
```

Inheritance diagram for TagTree:



Public Member Functions

- TagTree (string tagName, BlkNumType blknum, PartitionManager ∗pm)
- ∼TagTree ()
- void write_out ()
- void read_in (unordered_multimap< string, FileInfo ∗> ∗allFiles, RootTree ∗rootTree)
- void del ()

Additional Inherited Members

5.32.1 Constructor & Destructor Documentation

5.32.1.1 TagTree()

```
TagTree::TagTree (
            string tagName,
            BlkNumType blknum,
            PartitionManager * pm )
```

Parameters

tagName	the name of this tag
blknum	the blocknumber for the superblock of this tagTree

5.32.1.2 ∼TagTree()

```
TagTree::∼TagTree ( )
```

5.32.2 Member Function Documentation

5.32.2.1 del()

```
void TagTree::del ( ) [virtual]
```

Will completely remove the TreeObject's presence on disk

Implements TreeObject.

5.32.2.2 read_in()

```
void TagTree::read_in (
            unordered_multimap< string, FileInfo *> * allFiles,
            RootTree * rootTree ) [virtual]
```

Will read in all object data from disk

Parameters

allFiles	a pointer to the map of all files
rootTree	a pointer to the root tree

Implements TreeObject.

5.32.2.3 write_out()

```
void TagTree::write_out ( )  [virtual]
```

Intended to write out the object to disk

Implements TreeObject.

The documentation for this class was generated from the following files:

- Filesystem/DaemonDependancies/Trees/Trees.h
- Filesystem/DaemonDependancies/Trees/Trees.cpp

5.33 tagTreeSuperBlock Struct Reference

```
#include <types.h>
```

Public Attributes

- size_t size
- Index lastEntry
- BlkNumType startBlock

5.33.1 Member Data Documentation

5.33.1.1 lastEntry

```
Index tagTreeSuperBlock::lastEntry
```

5.33.1.2 size

```
size_t tagTreeSuperBlock::size
```

5.33.1.3 startBlock

```
BlkNumType tagTreeSuperBlock::startBlock
```

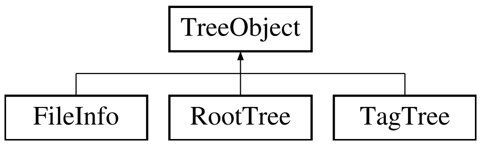
The documentation for this struct was generated from the following file:

- Filesystem/DaemonDependancies/Types/types.h

5.34 TreeObject Class Reference

```
#include <Trees.h>
```

Inheritance diagram for TreeObject:



Public Member Functions

- virtual ∼TreeObject ()
- TreeObject (string name, BlkNumType blknum, PartitionManager ∗pm)

Accessor Functions

- string get_name () const
- BlkNumType get_block_number () const
- Index get_index (TreeObject ∗obj) const
- Index get_last_entry () const
- BlkNumType get_start_block () const
- size_t size () const
- unordered_map< string, TreeObject ∗ >::iterator begin ()
- unordered_map< string, TreeObject ∗ >::iterator end ()
- TreeObject ∗ find (string name) const
- queue< Index > ∗ get_free_spots ()

Modifier Functions

- void set_name (string name)
- void add_index (TreeObject ∗obj, Index index)
- void set_last_entry (Index index)
- virtual void insert (string name, TreeObject ∗obj)
- virtual void erase (string name)
- virtual void insert_addition (TreeObject ∗add)
- virtual void insert_deletion (TreeObject ∗del)

Disk Functions

- virtual void write_out ()=0
- virtual void read_in (unordered_multimap< string, FileInfo ∗> ∗allFiles, RootTree ∗rootTree)=0
- virtual void del ()=0
- void increment_allocate (Index ∗index)
- void increment_follow (Index ∗index)

Protected Member Functions

- virtual void delete_cont_blocks (BlkNumType blknum)

Protected Attributes

- queue< Modification * > _modifications

  A collection of associated Modifications.
- unordered_map< string, TreeObject * > _myTree

  A collection of contained TreeObjects.
- string _name

  name or value
- BlkNumType _blockNumber

  Blocknumber of the superblock on disk.
- unordered_map< TreeObject *, Index > _indeces

  location(s) of the superblock entry(ies) on disk
- Index _lastEntry

  Index of the last entry of data on disk.
- BlkNumType _startBlock

  blocknumber of the start of this data on disk
- PartitionManager * _myPartitionManager

  Associated PartitionManager.
- queue< Index > _freeSpots

5.34.1 Constructor & Destructor Documentation

5.34.1.1 ∼TreeObject()

```
TreeObject::∼TreeObject ( )  [virtual]
```

5.34.1.2 TreeObject()

```
TreeObject::TreeObject (
             string name,
             BlkNumType blknum,
             PartitionManager * pm )
```

Parameters

name	name of this object
blknum	blocknumber of the superblock
pm	PartitionManager object to be associated with this object

5.34.2 Member Function Documentation

5.34.2.1 add_index()

```
void TreeObject::add_index (
            TreeObject * obj,
            Index index )
```

Add an index to _indeces for the specified TreeObject. If the index already existed. nothing happpens

Parameters

obj	the object that the Index references to
index	the Index of obj

5.34.2.2 begin()

```
unordered_map< string, TreeObject * >::iterator TreeObject::begin ( )
```

Returns

An iterator to the beginning of the TreeObjects associated with this object

5.34.2.3 del()

```
virtual void TreeObject::del ( ) [pure virtual]
```

Will completely remove the TreeObject's presence on disk

Implemented in RootTree, TagTree, and FileInfo.

5.34.2.4 delete_cont_blocks()

```
void TreeObject::delete_cont_blocks (
            BlkNumType blknum ) [protected], [virtual]
```

Will follow the chain of continuation blocks and free all of them

Parameters

blknum	will free the blknum and use it to follow the chain of continuation blocks

Reimplemented in FileInfo.

5.34.2.5 end()

```
unordered_map< string, TreeObject * >::iterator TreeObject::end ( )
```

Returns

An iterator to the end of the TreeObjects associated with this object

5.34.2.6 erase()

```
void TreeObject::erase (
             string name )  [virtual]
```

Disassociate the given name from this object

Parameters

name	the name of the object to be erased.

Exceptions

arboreal_logic_error	

Reimplemented in FileInfo.

5.34.2.7 find()

```
TreeObject * TreeObject::find (
             string name ) const
```

Search _myTree for the specified name

Parameters

name	the name of the desired object

Returns

a pointer to the object if found, 0 otherwise

5.34.2.8 get_block_number()

```
BlkNumType TreeObject::get_block_number ( ) const
```

Returns

The blocknumber of the superblock

5.34.2.9 get_free_spots()

```
queue< Index > * TreeObject::get_free_spots ( )
```

Returns

a pointer to the queue of empty spaces where new entries can be added

5.34.2.10 get_index()

```
Index TreeObject::get_index (
            TreeObject * obj ) const
```

Searches for obj and returns the Index of obj on disk, if found

Parameters

obj	object whose position is desired

Returns

The Index of obj on disk,

Exceptions

arboreal_logic_error	

5.34.2.11 get_last_entry()

```
Index TreeObject::get_last_entry ( ) const
```

Find the Index of the last entry for this object on disk

Returns

Index of the last entry on disk

5.34.2.12 get_name()

```
string TreeObject::get_name ( ) const
```

Returns

The name

5.34.2.13 get_start_block()

```
BlkNumType TreeObject::get_start_block ( ) const
```

Returns

The start block of data for this object

5.34.2.14 increment_allocate()

```
void TreeObject::increment_allocate (
             Index * index )
```

Will increment the Index passed and allocate blocks if necessary to do so

Parameters

index	the Index to be incremented

5.34.2.15 increment_follow()

```
void TreeObject::increment_follow (
            Index * index )
```

Will increment the Index passed but only follow the chain of already allocated blocks

Parameters

index	the Index to be incremented

5.34.2.16 insert()

```
void TreeObject::insert (
            string name,
            TreeObject * obj )  [virtual]
```

Associate a TreeObject with this object

Parameters

name	name of the object, mangled if inserting a FileInfo
obj	the object to be inserted

Exceptions

tag_error	

See also

FileInfo::insert()

Reimplemented in FileInfo.

5.34.2.17 insert_addition()

```
void TreeObject::insert_addition (
            TreeObject * add )  [virtual]
```

Add an Addition to the list of Modifications so that it can be written out later. Note: Do not call this on a FileInfo.

Parameters

add	the object that was previously inserted to this object which will be added to the list of Modifications

See also

FileSystem::write_out() TreeObject::insert()

Reimplemented in FileInfo.

5.34.2.18 insert_deletion()

```
void TreeObject::insert_deletion (
            TreeObject * del )  [virtual]
```

Add a Deletion to the list of Modifications so that it can be written out later. Note: Do not call this on a FileInfo.

Parameters

del	the object that was previously erased from this object which will be added to the list of Modifications

See also

FileSystem::write_out() TreeObject::erase()

Reimplemented in FileInfo.

5.34.2.19 read_in()

```
virtual void TreeObject::read_in (
            unordered_multimap< string, FileInfo *> * allFiles,
            RootTree * rootTree )  [pure virtual]
```

Will read in all object data from disk

Parameters

allFiles	a pointer to the map of all files
rootTree	a pointer to the root tree

Implemented in RootTree, TagTree, and FileInfo.

5.34.2.20 set_last_entry()

```
void TreeObject::set_last_entry (
            Index index )
```

Set the last Index for the last entry belonging to this object on disk

Parameters

index	The last Index

5.34.2.21 set_name()

```
void TreeObject::set_name (
             string name )
```

Set the name

Parameters

name	The new name

5.34.2.22 size()

```
size_t TreeObject::size ( ) const
```

Returns

The size of _myTree

5.34.2.23 write_out()

```
virtual void TreeObject::write_out ( )  [pure virtual]
```

Intended to write out the object to disk

Implemented in RootTree, TagTree, and FileInfo.

5.34.3 Member Data Documentation

5.34.3.1 _blockNumber

```
BlkNumType TreeObject::_blockNumber  [protected]
```

Blocknumber of the superblock on disk.

5.34.3.2 _freeSpots

```
queue<Index> TreeObject::_freeSpots  [protected]
```

5.34.3.3 _indeces

```
unordered_map<TreeObject*, Index> TreeObject::_indeces  [protected]
```

location(s) of the superblock entry(ies) on disk

5.34.3.4 _lastEntry

```
Index TreeObject::_lastEntry  [protected]
```

Index of the last entry of data on disk.

5.34.3.5 _modifications

```
queue<Modification*> TreeObject::_modifications  [protected]
```

A collection of associated Modifications.

5.34.3.6 _myPartitionManager

```
PartitionManager* TreeObject::_myPartitionManager  [protected]
```

Associated PartitionManager.

5.34.3.7 _myTree

```
unordered_map<string, TreeObject*> TreeObject::_myTree  [protected]
```

A collection of contained TreeObjects.

5.34.3.8 _name

```
string TreeObject::_name  [protected]
```

name or value

5.34.3.9 _startBlock

```
BlkNumType TreeObject::_startBlock  [protected]
```

blocknumber of the start of this data on disk

The documentation for this class was generated from the following files:

- Filesystem/DaemonDependancies/Trees/Trees.h
- Filesystem/DaemonDependancies/Trees/Trees.cpp

Chapter 6

File Documentation

6.1 CommandLineInterface/CLDependancies/cli_helper.hpp File Reference

Macros

- #define INCLUSIVE 0
- #define EXCLUSIVE 1
- #define NEW_AND_TAG 2
- #define NEW_AND_TAG_EXC 3
- #define MERGE_1 4
- #define MERGE_2 5
- #define TAG_1 6
- #define TAG_2 7
- #define TAG_3 8
- #define OPEN 9

Functions

- void clean (int signal)
- void bad_clean (int signal)
- void delete_shm (int shm_id, char ∗shm)
- char ∗ create_shm_seg (key_t key, int &id)
- int get_cmnd_id (char ∗cmnd)
- int set_up_socket (std::string client_sockpath, struct sockaddr_un &client_sockaddr)
- void connect_to_server (int client_sock, std::string client_sockpath, std::string server_sockpath, struct sockaddr_un &server_sockaddr, socklen_t len)
- void send_to_server (int client_sock, std::string client_sockpath, const char ∗cmnd, int size, int flag)
- char ∗ receive_from_server (int client_sock, std::string client_sockpath, int size, int flag)

6.1.1 Macro Definition Documentation

6.1.1.1 EXCLUSIVE

```
#define EXCLUSIVE 1
```

6.1.1.2 INCLUSIVE

```
#define INCLUSIVE 0
```

6.1.1.3 MERGE_1

```
#define MERGE_1 4
```

6.1.1.4 MERGE_2

```
#define MERGE_2 5
```

6.1.1.5 NEW_AND_TAG

```
#define NEW_AND_TAG 2
```

6.1.1.6 NEW_AND_TAG_EXC

```
#define NEW_AND_TAG_EXC 3
```

6.1.1.7 OPEN

```
#define OPEN 9
```

6.1.1.8 TAG_1

```
#define TAG_1 6
```

6.1.1.9 TAG_2

```
#define TAG_2 7
```

6.1.1.10 TAG_3

```
#define TAG_3 8
```

6.1.2 Function Documentation

6.1.2.1 bad_clean()

```
void bad_clean (
            int signal )
```

Remove Socket Files in case of interrrupt signals Called when signals indicating illegal operations (such as SIGS↩ EG) are thrown

Parameters

signal	Value returned by signal() function call

6.1.2.2 clean()

```
void clean (
            int signal )
```

Remove Socket Files in case of interrrupt signals Called when signals originating from the user (such as SIGINT (control-C)) are thrown

Parameters

signal	Value returned by signal() function call

6.1.2.3 connect_to_server()

```
void connect_to_server (
            int client_sock,
            std::string client_sockpath,
            std::string server_sockpath,
            struct sockaddr_un & server_sockaddr,
            socklen_t len )
```

Attempt to initiate a connection to the Liaison process

Parameters

client_sock	Client socket identifiaction number
client_sockpath	Client socket pathname
server_sockpath	Server socket pathname
server_sockaddr	A reference to a standard structure whose components I will not describe here and can be viewed in a Unix manual. Suffice it to say, it stores the socket type and the socket path. (Note that the "type" of the struct is sockaddr_un signifing that this is a unix domain socket)
len	Size of server_sockaddr in bytes (from sizeof())

6.1.2.4 create_shm_seg()

```
char* create_shm_seg (
            key_t key,
            int & id )
```

Create and attach a Shared Memory Segment

Parameters

key	The Key required to access the Shared Memory Segment
id	Address of an integer variable that will store the created segments identification number

6.1.2.5 delete_shm()

```
void delete_shm (
            int shm_id,
            char * shm )
```

Delete a Shared Memory Fragment Shared Memory Fragments can only be deleted if they are not attached to anything Calling this function without having previously unattached a process from a segment will result in failure

shm_id: The Shared Memory Fragment's identifier shm: The pointer to the Shared Memory

6.1.2.6 get_cmnd_id()

```
int get_cmnd_id (
            char * cmnd )
```

Extracts the Command ID from a buffer created using CLI::build() And returns it as an integer.

Parameters

cmnd	A C-Style string created using CLI::build()

6.1.2.7 receive_from_server()

```
char* receive_from_server (
            int client_sock,
            std::string client_sockpath,
            int size,
            int flag )
```

Receive data from File System, returns a C-String containing the Data

Parameters

client_sock	Client socket identification number
client_sockpath	Client socket pathname
size	Size of command to be recieved
flag	Flag for 'recv()' call (see 'man recv')

6.1.2.8 send_to_server()

```
void send_to_server (
            int client_sock,
            std::string client_sockpath,
            const char * cmnd,
            int size,
            int flag )
```

Send a command to the Liaison process

Parameters

client_sock	Client socket identification number
client_sockpath	Client socket pathname
cmnd	Command to be sent
size	Size of 'cmnd'
flag	Flag for 'send()' call (see 'man send')

6.1.2.9 set_up_socket()

```
int set_up_socket (
            std::string client_sockpath,
            struct sockaddr_un & client_sockaddr )
```

Create and set-up a socket used for communication with Liaison process Returns the client socket's identification number

Parameters

client_sockpath	Client Socket's pathname
client_sockaddr	A reference to a standard structure whose components I will not describe here and can be viewed in a Unix manual. Suffice it to say, it stores the socket type and the socket path. (Note that the "type" of the struct is sockaddr_un signifing that this is a unix domain socket)

6.2 CommandLineInterface/CLHeaders/Cli.h File Reference

```
#include <string>
#include <iostream>
#include <vector>
#include <errno.h>
#include <unistd.h>
#include <sys/socket.h>
#include <sys/un.h>
#include <sys/ipc.h>
#include <sys/shm.h>
#include <signal.h>
#include <sys/types.h>
#include <sys/wait.h>
#include "../../SharedHeaders/Arboreal_Exceptions.h"
#include "../../SharedHeaders/Print.h"
#include "../../SharedHeaders/DebugMessages.hpp"
```

Classes

- class CLI

Variables

- static const int MaxBufferSize = 4096
- static const int SharedMemorySize = 1
- static const int Permissions = 0666
- static const int Flag = 0
- DebugMessages Debug

6.2.1 Variable Documentation

6.2.1.1 Debug

```
DebugMessages Debug
```

Socket Send/Recv Flag

6.2.1.2 Flag

```
const int Flag = 0  [static]
```

Socket Permissions

6.2.1.3 MaxBufferSize

```
const int MaxBufferSize = 4096  [static]
```

Strings

cout

Vectors

errno Definitions

Unix Std. Stuff

Socket Handling

Unix Domain Socket Stuff

Inter Process Communication Stds.

Shared Memory Handling

Signal Handling

System Types Definitions

Wait Calls

6.2.1.4 Permissions

```
const int Permissions = 0666  [static]
```

Size of Shared Memory Segment

6.2.1.5 SharedMemorySize

```
const int SharedMemorySize = 1  [static]
```

Maximum size a command can be

6.3 CommandLineInterface/Cli.cpp File Reference

```
#include "CLHeaders/Cli.h"
#include "CLDependancies/cli_helper.hpp"
```

Functions

- int main (int argc, char **argv)

6.3.1 Function Documentation

6.3.1.1 main()

```
int main (
            int argc,
            char ** argv )
```

The Command Line has several different modes of execution

Mode 1: The most standard mode requires that a partition name be passed as an argument. The partition name must exist on the filesystem if it does not, the commandline will quit. This mode expects the user to manually type commands into the command line interface. This mode's run command looks like: './commandline PartitionName'

Mode 2: The second mode adds debugging information to Mode 1 The flag that must be passed to enable this mode is '-d' This mode's run command looks like: './commandline PartitionName -d'

Mode 3: The third mode operates simmilar to Mode 1 except that rather than expecting users to manually type commands in, it expects a file containing all of the commands that will be executed, to be piped to it. This mode still requires that a legal partition be passed. The flag that must be passed to enable this mode is '-d' This mode's run command looks like: '.commandline PartitionName -s'

Mode 4: The fourth and final mode adds debugging support to Mode 3. The flag that must be passed to enable this mode is '-d' This mode's run command looks like: './commandline PartitionName -s -d'

Parameters

argc	The argument count (Not passed by user)
argv	The argument values (Passed by user)

Returns

An integer always equal to 0

6.4 diskInfo.d File Reference

6.5 exthd.d File Reference

6.6 Filesystem/daemon.cpp File Reference

```
#include <thread>
#include <errno.h>
#include <unistd.h>
#include <sys/socket.h>
#include <sys/un.h>
#include <sys/ipc.h>
#include <sys/shm.h>
```

```
#include <netinet/in.h>
#include <netdb.h>
#include <sys/ioctl.h>
#include <signal.h>
#include <chrono>
#include <ctime>
#include "DaemonDependancies/FileSystem/FileSystem.h"
#include "DaemonDependancies/File/File.h"
#include "DaemonHeaders/daemon.h"
#include "../SharedHeaders/Print.h"
```

Macros

- #define STARTTUPDATA "Data/startup_time.txt"

Functions

- int main (int argc, char **argv)

6.6.1 Macro Definition Documentation

6.6.1.1 STARTTUPDATA

```
#define STARTTUPDATA "Data/startup_time.txt"
```

6.6.2 Function Documentation

6.6.2.1 main()

```
int main (
            int argc,
            char ** argv )
```

6.7 Filesystem/DaemonDependancies/Disk/Disk.cpp File Reference

```
#include "Disk.h"
```

6.8 Filesystem/DaemonDependancies/Disk/Disk.h File Reference

```
#include "../Types/types.h"
```

Classes

- class Disk

6.9 Filesystem/DaemonDependancies/DiskManager/DiskManager.cpp File Reference

```
#include "DiskManager.h"
```

Functions

- bool operator== (const DiskPartition ∗lhs, const DiskPartition &rhs)

6.9.1 Function Documentation

6.9.1.1 operator==()

```
bool operator== (
            const DiskPartition * lhs,
            const DiskPartition & rhs )
```

6.10 Filesystem/DaemonDependancies/DiskManager/DiskManager.h File Reference

```
#include "../Types/types.h"
#include "../Disk/Disk.h"
```

Classes

- struct DiskPartition
- class DiskManager

Functions

- bool operator== (const DiskPartition ∗lhs, const DiskPartition &rhs)

6.10.1 Function Documentation

6.10.1.1 operator==()

```
bool operator== (
             const DiskPartition * lhs,
             const DiskPartition & rhs )
```

6.11 Filesystem/DaemonDependancies/File/File.cpp File Reference

```
#include "File.h"
```

6.12 Filesystem/DaemonDependancies/File/File.h File Reference

```
#include "../Types/types.h"
```

Classes

- class File

6.13 Filesystem/DaemonDependancies/FileSystem/FileSystem.cpp File Reference

```
#include "FileSystem.h"
```

Variables

- bool EncryptionFlag = false

6.13.1 Variable Documentation

6.13.1.1 EncryptionFlag

```
bool EncryptionFlag = false
```

6.14 Filesystem/DaemonDependancies/FileSystem/FileSystem.h File Reference

```
#include "../Types/types.h"
#include "../Disk/Disk.h"
#include "../DiskManager/DiskManager.h"
#include "../PartitionManager/PartitionManager.h"
#include "../Trees/Trees.h"
```

Classes

- class FileOpen
- class FileSystem

6.15 Filesystem/DaemonDependancies/PartitionManager/PartitionManager.cpp File Reference

```
#include "PartitionManager.h"
```

Variables

- bool DEBUG = false

6.15.1 Variable Documentation

6.15.1.1 DEBUG

```
bool DEBUG = false
```

6.16 Filesystem/DaemonDependancies/PartitionManager/PartitionManager.h File Reference

```
#include "../Types/types.h"
#include "../DiskManager/DiskManager.h"
```

Classes

- class PartitionManager

6.17 Filesystem/DaemonDependancies/Trees/Trees.cpp File Reference

```
#include "Trees.h"
```

Functions

- bool operator== (Index &lhs, Index &rhs)
- bool operator!= (Index &lhs, Index &rhs)

6.17.1 Function Documentation

6.17.1.1 operator"!=()

```
bool operator!= (
            Index & lhs,
            Index & rhs )
```

6.17.1.2 operator==()

```
bool operator== (
            Index & lhs,
            Index & rhs )
```

6.18 Filesystem/DaemonDependancies/Trees/Trees.h File Reference

```
#include "../Types/types.h"
#include "../PartitionManager/PartitionManager.h"
```

Classes

- class Attributes
- class Modification
- class Addition
- class Deletion
- class TreeObject
- class FileInfo
- class TagTree
- class RootTree

Macros

- #define DEFAULTOWNER 1
- #define DEFAULTPERMISSIONS 0

6.18.1 Macro Definition Documentation

6.18.1.1 DEFAULTOWNER

```
#define DEFAULTOWNER 1
```

6.18.1.2 DEFAULTPERMISSIONS

```
#define DEFAULTPERMISSIONS 0
```

6.19 Filesystem/DaemonDependancies/Types/types.h File Reference

```
#include <iostream>
#include <fstream>
#include <stdio.h>
#include <string>
#include <string.h>
#include <cstring>
#include <queue>
#include <vector>
#include <unordered_set>
#include <map>
#include <unordered_map>
#include <algorithm>
#include <utility>
#include <cstdlib>
#include <time.h>
#include "../../../SharedHeaders/Arboreal_Exceptions.h"
```

Classes

- struct index
- struct rootSuperBlock
- struct tagTreeSuperBlock
- struct file_attributes
- struct finode

Macros

- #define MAXopen_fileS 1000

Typedefs

- typedef unsigned long BlkNumType
- typedef struct index Index
- typedef struct rootSuperBlock RootSuperBlock
- typedef struct tagTreeSuperBlock TagTreeSuperBlock
- typedef struct finode Finode
- typedef struct file_attributes FileAttributes

Variables

- bool DEBUG

6.19.1 Macro Definition Documentation

6.19.1.1 MAXopen_fileS

```
#define MAXopen_fileS 1000
```

6.19.2 Typedef Documentation

6.19.2.1 BlkNumType

```
typedef unsigned long BlkNumType
```

6.19.2.2 FileAttributes

```
typedef struct file_attributes FileAttributes
```

6.19.2.3 Finode

```
typedef struct finode Finode
```

6.19.2.4 Index

```
typedef struct index Index
```

6.19.2.5 RootSuperBlock

```
typedef struct rootSuperBlock RootSuperBlock
```

6.19.2.6 TagTreeSuperBlock

```
typedef struct tagTreeSuperBlock TagTreeSuperBlock
```

6.19.3 Variable Documentation

6.19.3.1 DEBUG

```
bool DEBUG
```

6.20 Filesystem/DaemonHeaders/daemon.h File Reference

```
#include "../../SharedHeaders/Parser.h"
#include "../../SharedHeaders/DebugMessages.hpp"
```

Macros

- #define CREATEFILEDATA "Data/create_file_time.txt"
- #define CREATETAGDATA "Data/create_tag_time.txt"
- #define TAGSEARCHDATA "Data/tag_search_time.txt"
- #define FILESEARCHDATA "Data/file_search_time.txt"
- #define TAGFILEDATA "Data/tag_file_time.txt"
- #define RENAMETAGDATA "Data/rename_tag_time.txt"

Functions

- void sig_caught (int sig)
- void save_to_disk (void)
- std::string command_to_string (char ∗cmnd, int size)
- int create_sock (int timeout)
- void set_socket_opt (int daemon_sock, int sock_opt, int timeout)
- void set_nonblocking (int daemon_sock, int is_on)
- void bind_socket (int daemon_sock, struct sockaddr_in daemon_sockaddr, int timeout)
- void listen_on_socket (int daemon_sock, int backlog, int timeout)
- int get_cmnd_id (char ∗cmnd)
- std::string get_partition (char ∗cmnd)
- bool is_number (const char ∗str)
- std::string pad_string (std::string string, int size, char value)
- std::unordered_set< std::string > get_set (char ∗command, char delim)
- std::unordered_set< std::string > get_set (std::vector< std::string > vec)
- std::string get_file_info (File ∗file)
- std::string get_file_info (FileInfo ∗file)
- std::string get_short_file_info (FileInfo ∗file, int num_tags)
- std::vector< std::string > serialize_fileinfo (std::vector< FileInfo ∗> ∗fileinfo)
- void execute (int id, char ∗command, int fd, std::vector< std::string > &data)

Variables

- static const int BACKLOG = 10
- static const int FLAG = 0
- static const int TIMEOUT = 10
- static const int TRUE = 1
- static const int FALSE = 0
- static const int PORT = 70777
- static const int MAX_COMMAND_SIZE = 4096
- static const int WRITE_CHANGES_WAIT = 1
- static const bool WILL_TIME = false
- DebugMessages Debug
- fd_set master_set
- int my_fid = 999
- int max_fid = 0
- int current_command_id = 0
- bool verbose = false
- std::vector< std::string > data
- std::map< int, FileSystem ∗ > fd_fs_map
- std::map< std::string, FileSystem ∗ > part_fs_map
- std::map< std::string, unsigned int > path_filedesc_map
- Disk ∗ d = 0
- DiskManager ∗ dm = 0

6.20.1 Macro Definition Documentation

6.20.1.1 CREATEFILEDATA

```
#define CREATEFILEDATA "Data/create_file_time.txt"
```

Data file locations for timing tests

6.20.1.2 CREATETAGDATA

```
#define CREATETAGDATA "Data/create_tag_time.txt"
```

6.20.1.3 FILESEARCHDATA

```
#define FILESEARCHDATA "Data/file_search_time.txt"
```

6.20.1.4 RENAMETAGDATA

```
#define RENAMETAGDATA "Data/rename_tag_time.txt"
```

6.20.1.5 TAGFILEDATA

```
#define TAGFILEDATA "Data/tag_file_time.txt"
```

6.20.1.6 TAGSEARCHDATA

```
#define TAGSEARCHDATA "Data/tag_search_time.txt"
```

6.20.2 Function Documentation

6.20.2.1 bind_socket()

```
void bind_socket (
             int daemon_sock,
             struct sockaddr_in daemon_sockaddr,
             int timeout )
```

Bind socket to Port number

Parameters

daemon_sock	Daemon socket ID
daemon_sockaddr	Daemon socket address
timeout	Retry time length

Returns

VOID

6.20.2.2 command_to_string()

```
std::string command_to_string (
              char * cmnd,
              int size )
```

Convert a command line interface command buffer into a string Used only for debugging puposes

Parameters

cmnd	The command to be converted
size	The size of the command buffer

Returns

A std::string of the data within the buffer minus the first X bytes where X is the size of an integer

6.20.2.3 create_sock()

```
int create_sock (
              int timeout )
```

Create the daemon socket If socket creation fails, keep trying until you hit TIMEOUT

Parameters

timeout	Length of time in seconds which the function should attempt to create socket in the case of failure

Returns

An integer, socket ID

6.20.2.4 execute()

```
void execute (
             int id,
             char * command,
             int fd,
             std::vector< std::string > & data )
```

Execute the proper File System action based on a command id and command data Apply those actions to the correct FS object by using the fd_fs_map and the file descriptor passed

Parameters

id	The command to be executed's ID
command	The command to be executed's data
fd	The file descriptor that requested this command, the resulting data will be passed back to it and the changes will occure on the FS object that it is tied to

Returns

A std::vector of std::string's comprising the data returned by the command execution, this could be anything from an error mesage, to a success message, to a bunch of file information

6.20.2.5 get_cmnd_id()

```
int get_cmnd_id (
             char * cmnd )
```

Convert the first X characters in a 'Command Buffer' to an integer value X is the size of an integer

Parameters

cmnd	: The command buffer

6.20.2.6 get_file_info() [1/2]

```
std::string get_file_info (
             File * file )
```

Returns a string containing some of a Files attributes

Parameters

file	A pointer to a File object containing the file's attributes

Returns

A std::string containing some of the file's attributes

6.20.2.7 get_file_info() [2/2]

```
std::string get_file_info (
            FileInfo * file )
```

Overloaded version of get_file_info() which takes as a parameter a pointer to a FileInfo object rather than a File object

Parameters

file	A pointer to a FileInfo object containing the file's attributes

Returns

A std::string containing some of the file's attributes

6.20.2.8 get_partition()

```
std::string get_partition (
            char * cmnd )
```

Get the partition a Command Line would like to connect to as a std::string rather than char∗

Parameters

cmnd	Command Line command buffer SPECIFICALLY, the one sent by start() in order to initiate the handshake process

Returns

The partition name as a std::string

6.20.2.9 get_set() [1/2]

```
std::unordered_set<std::string> get_set (
            char * command,
            char delim )
```

Return a set representation of the data within a buffer sent by the Liaison process This is most commonly used in order to b reak down a string such as a path into its constituent parts using a charcter delimeter. For example, sending /tag1/tag2/tag3 to this function will return an unordered set containing [tag1,tag2,tag3]

Parameters

command	The command that needs to be split into parts
delim	The charchter that will be used as the delimeter marking where the function needs to split the command

Returns

An unordered set of the command contents minus the delimiting charachters

6.20.2.10 get_set() [2/2]

```
std::unordered_set<std::string> get_set (
            std::vector< std::string > vec )
```

Overloaded version of get_set() which takes as its parameter a vector This function does not require a delimiter instead it just pushes the items from the vector into an unordered_set

Parameters

vec	The vector that needs to be converted into an unordered_set

Returns

A std::unordered_set containing the vector's contents

6.20.2.11 get_short_file_info()

```
std::string get_short_file_info (
            FileInfo * file,
            int num_tags )
```

Get A shortened version of the file information The shortened file info conatains the file name, the first X tags were X = num_tags and the creation timestamp The number os tags is less than the value for num_tags, the actual number of tags will be used instead

Parameters

file	The file who's info we want
num_tags	Number of tags to display

Returns

A std::string containing the file information

6.20.2.12 is_number()

```
bool is_number (
             const char * str )
```

Returns true if a buffer sent by the Liaison process is a number or not Used to check when the Liaison has issued a new command rather than just more data for the previous command The buffer must first be converted into a string This function will only work with strings sent by the Liaison AFTER having completed a handshake, that is it is only valid for string constructed using the Parser and should NOT contain byte representations of numbers

Parameters

str	A string litteral

Returns

TRUE if the string is a number | FALSE otherwise

6.20.2.13 listen_on_socket()

```
void listen_on_socket (
             int daemon_sock,
             int backlog,
             int timeout )
```

Mark socket as open for receiving connections

Parameters

daemon_sock	Daemon socket ID
backlog	Number of connections that listen can queue up
timeout	Retry time length

Returns

VOID

6.20.2.14 pad_string()

```
std::string pad_string (
             std::string string,
             int size,
             char value )
```

Pad a std::string with a certain character to a certain length Pads from the back only

Parameters

string	String to be padded
size	Number of characters to append
value	Which charachter to pad the string with

Returns

The padded string

6.20.2.15 save_to_disk()

```
void save_to_disk (
            void  )
```

Quit the Daemon; Delete data properly and signal other processes that need to be aware of the quit

This function is run by a thread that is detatched from the main process

Returns

VOID

Periodically write all changes to disk Interval in between writes can be adjusted by changing the value of WRITE↩
_CHANGES_WAIT

This function is run by a thread that is detatched from the main process

Returns

VOID

6.20.2.16 serialize_fileinfo()

```
std::vector<std::string> serialize_fileinfo (
            std::vector< FileInfo *> * fileinfo )
```

Uses get_file_info() to return a vector of file info strings The File System functions which return file attributes, can return as many file attributes as there are files, typically this means that a vector of FileInfo pointers is returned, this function converts all of those FileInfo pointers into strings containing the respective file information

Parameters

fileinfo	A std::vector of FileInfo pointers

Returns

A std::vector of std::string's returned from get_file_info()

6.20.2.17 set_nonblocking()

```
void set_nonblocking (
            int daemon_sock,
            int is_on )
```

Set socket to nonblocking mode in order to have continuous data streams this will also set any connecting sockets to nonblocking

Parameters

daemon_sock	Daemon socket ID
is_on	Wether nonblocking mode should be turned on or off (1 == ON | 0 == OFF)

Returns

VOID

6.20.2.18 set_socket_opt()

```
void set_socket_opt (
            int daemon_sock,
            int sock_opt,
            int timeout )
```

Set socket options, this mainly allows the same socket address to be reused by the program when it starts up again. Normally socket addresses are one time use, this causes issues if you would like to quit the FS and then begin it again, so we must force a reuse

Parameters

daemon_sock	Daemon socket ID
sock_opt	Used by setsockopt() see man pages
timeout	Time in seconds the function should retry for if seet options fails

Returns

VOID

6.20.2.19 sig_caught()

```
void sig_caught (
             int sig )
```

Catch either a user generated or system generated termination signal

Parameters

sig	The generated signals ID, passed to the function by the call to signal(), DO NOT supply this yourself, it is supplied automatically by the system.

Returns

VOID

6.20.3 Variable Documentation

6.20.3.1 BACKLOG

```
const int BACKLOG = 10  [static]
```

Number of Connection Requests that the Server Can Queue

6.20.3.2 current_command_id

```
int current_command_id = 0
```

The Command Being Operated On's ID Some commands come in as lists and must be executed one part of the list at a time, in these cases it is paramount that the same command be executed. This value will not change until the daemon recevies new data that begins with a number (the command ID)

6.20.3.3 d

```
Disk* d = 0
```

Disk Object

6.20.3.4 data

```
std::vector<std::string> data
```

The data the daemon has received

6.20.3.5 Debug

```
DebugMessages Debug
```

Handles Debugging

6.20.3.6 dm

```
DiskManager* dm = 0
```

Disk Manager

6.20.3.7 FALSE

```
const int FALSE = 0  [static]
```

Integer Boolean False

6.20.3.8 fd_fs_map

```
std::map<int, FileSystem*> fd_fs_map
```

Maps a file descriptor (socket) to a Partition

6.20.3.9 FLAG

```
const int FLAG = 0  [static]
```

Flag for recv()

6.20.3.10 master_set

```
fd_set master_set
```

Used for call to select() holds file descriptors

6.20.3.11 MAX_COMMAND_SIZE

```
const int MAX_COMMAND_SIZE = 4096  [static]
```

Maximum Buffer Size

6.20.3.12 max_fid

```
int max_fid = 0
```

Used by call to select() max_fid == 0 is FS socket

6.20.3.13 my_fid

```
int my_fid = 999
```

File system socket ID

6.20.3.14 part_fs_map

```
std::map<std::string,FileSystem*> part_fs_map
```

Maps a partition name to and FS object

6.20.3.15 path_filedesc_map

```
std::map<std::string, unsigned int> path_filedesc_map
```

Maps a pathname to a file descriptor (socket)

6.20.3.16 PORT

```
const int PORT = 70777  [static]
```

File System Port Number

6.20.3.17 TIMEOUT

```
const int TIMEOUT = 10  [static]
```

How Long Retries Should Take

6.20.3.18 TRUE

```
const int TRUE = 1  [static]
```

Integer Boolean True

6.20.3.19 verbose

```
bool verbose = false
```

Thread Synchonicity (No longer Used)

Thread Synchonicity (No longer Used)
More wordy return data for calls like 'find'

6.20.3.20 WILL_TIME

```
const bool WILL_TIME = false  [static]
```

Wether or Not Timing Test Should Be Performed

6.20.3.21 WRITE_CHANGES_WAIT

```
const int WRITE_CHANGES_WAIT = 1  [static]
```

How Long To Wait Before Writing Changes

6.21 Filesystem/driver.cpp File Reference

```
#include "DaemonDependancies/FileSystem/FileSystem.h"
```

Functions

- int main (int argc, char ∗∗argv)

Variables

- bool DEBUG = false

6.21.1 Function Documentation

6.21.1.1 main()

```
int main (
             int argc,
             char ** argv )
```

6.21.2 Variable Documentation

6.21.2.1 DEBUG

```
bool DEBUG = false
```

6.22 Filesystem/timing.cpp File Reference

```
#include <chrono>
#include <ctime>
#include <fstream>
#include <string>
#include <stdlib.h>
#include <vector>
#include "DaemonDependancies/FileSystem/FileSystem.h"
```

Macros

- #define CREATEFILEDATA "Data/create_file_time.txt"
- #define CREATETAGDATA "Data/create_tag_time.txt"
- #define TAGSEARCHDATA "Data/tag_search_time.txt"
- #define FILESEARCHDATA "Data/file_search_time.txt"
- #define TAGFILEDATA "Data/tag_file_time.txt"
- #define RENAMETAGDATA "Data/rename_tag_time.txt"
- #define STARTTUPDATA "Data/startup_time.txt"

Functions

- int main (int argc, char **argv)

6.22.1 Macro Definition Documentation

6.22.1.1 CREATEFILEDATA

```
#define CREATEFILEDATA "Data/create_file_time.txt"
```

6.22.1.2 CREATETAGDATA

```
#define CREATETAGDATA "Data/create_tag_time.txt"
```

6.22.1.3 FILESEARCHDATA

```
#define FILESEARCHDATA "Data/file_search_time.txt"
```

6.22.1.4 RENAMETAGDATA

```
#define RENAMETAGDATA "Data/rename_tag_time.txt"
```

6.22.1.5 STARTTUPDATA

```
#define STARTTUPDATA "Data/startup_time.txt"
```

6.22.1.6 TAGFILEDATA

```
#define TAGFILEDATA "Data/tag_file_time.txt"
```

6.22.1.7 TAGSEARCHDATA

```
#define TAGSEARCHDATA "Data/tag_search_time.txt"
```

6.22.2 Function Documentation

6.22.2.1 main()

```
int main (
             int argc,
             char ** argv )
```

6.23 FSFormat/format.cpp File Reference

```
#include "../Filesystem/DaemonDependancies/Types/types.h"
```

Functions

- int main (int argc, char **argv)

6.23.1 Function Documentation

6.23.1.1 main()

```
int main (
            int argc,
            char ** argv )
```

6.24 LiaisonProcess/liaison.cpp File Reference

```
#include <stdlib.h>
#include <string>
#include <iostream>
#include <vector>
#include <errno.h>
#include <stdio.h>
#include <unistd.h>
#include <sys/socket.h>
#include <sys/un.h>
#include <sys/ipc.h>
#include <sys/shm.h>
#include <chrono>
#include <ctime>
#include <netinet/in.h>
#include <netdb.h>
#include <signal.h>
#include "../SharedHeaders/Parser.h"
#include "../SharedHeaders/DebugMessages.hpp"
#include "../SharedHeaders/Arboreal_Exceptions.h"
#include "../SharedHeaders/Print.h"
#include "LiaisonDependancies/liason_helper.hpp"
```

Functions

- int main (int argc, char ∗∗argv)

Variables

- static const int Permissions = 0666
- static const int MaxBufferSize = 4096
- static const int SharedMemorySize = 1
- static const int Backlog = 10
- static const int Flag = 0
- static const int DaemonPort = 70777
- static const int Timeout = 10
- static const bool VERBOSE = false
- DebugMessages Debug
- Parser ∗ Parser = 0

6.24.1 Function Documentation

6.24.1.1 main()

```
int main (
            int argc,
            char ** argv )
```

6.24.2 Variable Documentation

6.24.2.1 Backlog

```
const int Backlog = 10  [static]
```

6.24.2.2 DaemonPort

```
const int DaemonPort = 70777  [static]
```

6.24.2.3 Debug

```
DebugMessages Debug
```

6.24.2.4 Flag

```
const int Flag = 0  [static]
```

6.24.2.5 MaxBufferSize

```
const int MaxBufferSize = 4096  [static]
```

6.24.2.6 Parser

```
Parser* Parser = 0
```

6.24.2.7 Permissions

```
const int Permissions = 0666  [static]
```

6.24.2.8 SharedMemorySize

```
const int SharedMemorySize = 1  [static]
```

6.24.2.9 Timeout

```
const int Timeout = 10  [static]
```

6.24.2.10 VERBOSE

```
const bool VERBOSE = false  [static]
```

6.25 LiaisonProcess/LiaisonDependancies/liason_helper.hpp File Reference

Macros

- #define NEW_PLUS "n+"

Functions

- void clean (int signal)
- void bad_clean (int signal)
- void seg_fault (int signal)
- int get_cmnd_id (const char ∗cmnd)
- std::string get_command_string (const char ∗cmnd, const int size)
- std::string pad_string (const std::string string, const int size, const char value)
- char ∗ get_shm_seg (const key_t key, int &id)
- void unat_shm (const int shm_id, const char ∗shm)
- int set_up_socket (std::string server_sockpath, struct sockaddr_un &server_sockaddr)
- void listen_for_client (const int server_sock, const std::string server_sockpath)
- int accept_client (int server_sock, struct sockaddr_un &client_sockaddr, socklen_t length, std::string server←_sockpath)
- void get_peername (const int client_sock, const struct sockaddr_un &client_sockaddr, const int server_sock, const std::string server_sockpath)
- char ∗ recv_msg (const int client_sock, const int size, const int flag, const int server_sock, const std::string server_sockpath, const std::string client_sockpath)
- void send_response (const int client_sock, const char ∗data, const int size, const int flag, const int server_←sock, const std::string server_sockpath, const std::string client_sockpath)
- void shutdown (const int liaison_fid, const int client_sock, const std::string client_sockpath, const int liaison←_sock, const std::string liaison_sockpath)
- int create_daemon_sock (const int client_sock, const std::string client_sockpath, const int liaison_sock, const std::string liaison_sockpath)
- void connect_to_daemon (int liaison_fid, struct sockaddr_in daemon_addr, const int client_sock, const std←::string client_sockpath, const int liaison_sock, const std::string liaison_sockpath)

6.25.1 Macro Definition Documentation

6.25.1.1 NEW_PLUS

```
#define NEW_PLUS "n+"
```

6.25.2 Function Documentation

6.25.2.1 accept_client()

```
int accept_client (
             int server_sock,
             struct sockaddr_un & client_sockaddr,
             socklen_t length,
             std::string server_sockpath )
```

Accept a connection request, returns the client socket's identifier

Parameters

server_sock	This server socket's identifier
client_sockaddr	A reference to a standard structure whose components I will not describe here and can be viewed in a Unix manual. Suffice it to say, it stores the socket type and the socket path. (Note that the "type" of the struct is sockaddr_un signifing that this is a unix domain socket). This will store the connecting client's information
length	The size of the server_sockaddr (This must be the size of the whole structure not just a single part and is most easily retrieved via a call to sizeof())
server_sockpath	This server socket's pathname

Returns

An integer, the client socket's ID

Exceptions

arboreal_liaison_error	

6.25.2.2 bad_clean()

```
void bad_clean (
             int signal )
```

Remove socket files. Called when a system generated interrupt is caught

Parameters

signal	The sytem signal that was received

Returns

VOID

6.25.2.3 clean()

```
void clean (
            int signal )
```

Remove socket files. Called when a user generated interrupt is caught

Parameters

signal	The sytem signal that was received

Returns

VOID

6.25.2.4 connect_to_daemon()

```
void connect_to_daemon (
            int liaison_fid,
            struct sockaddr_in daemon_addr,
            const int client_sock,
            const std::string client_sockpath,
            const int liaison_sock,
            const std::string liaison_sockpath )
```

Connect to the File System, everything after liaison_fid and daemon address is used in case of failure in order to ensure proper cleanup

Parameters

liaison_fid	The ID of the [Liaison –> File System] Socket
daemon_addr	A sockaddr_in structure to store the filesystem daemon info
client_sock	ID of the [Command Line –> Liaison] Socket
client_sockpath	The [Command Line –> Liaison] Socket's path
liaison_sock	ID of the [Liaison –> Command Line] Socket
liaison_sockpath	The [Liaison –> Command Line] Socket's path

Returns

VOID

6.25.2.5 create_daemon_sock()

```
int create_daemon_sock (
            const int client_sock,
            const std::string client_sockpath,
            const int liaison_sock,
            const std::string liaison_sockpath )
```

Create a new socket for the [Liaison –> File System] connection. All parameters passed are purely in case of failure so that proper cleanup can be done

Parameters

client_sock	ID of the [Command Line –> Liaison] Socket
client_sockpath	The [Command Line –> Liaison] Socket's path
liaison_sock	ID of the [Liaison –> Command Line] Socket
liaison_sockpath	The [Liaison –> Command Line] Socket's path

Returns

The created socket's ID

6.25.2.6 get_cmnd_id()

```
int get_cmnd_id (
            const char * cmnd )
```

Convert the first X charachters of a command buffer into an integer. X is the size of an integer

Parameters

cmnd	A charachter array created by the Command Line Interface

Returns

An integer representing the ID of cmnd

6.25.2.7 get_command_string()

```
std::string get_command_string (
             const char * cmnd,
             const int size )
```

Returns a string representation of a charachter array created with the Command Line

Parameters

cmnd	A charachter array created via the command line process
size	The size of the charachter array (usually equal to MaxBufferSize)

Returns

A std::string representation of the command minus the first X bytes (Where X is the size of an integer) that store the command ID

6.25.2.8 get_peername()

```
void get_peername (
             const int client_sock,
             const struct sockaddr_un & client_sockaddr,
             const int server_sock,
             const std::string server_sockpath )
```

Retrieve a accepted client's information for use in send/receive functionality

Parameters

client_sock	The client socket's identifier
client_sockaddr	A reference to a standard structure whose components I will not describe here and can be viewed in a Unix manual. Suffice it to say, it stores the socket type and the socket path. (Note that the "type" of the struct is sockaddr_un signifing that this is a unix domain socket). This will store the connecting client's information
server_sock	This server socket's identifier
server_sockpath	This server socket's pathname

Returns

VOID

Exceptions

arboreal_liaison_error	

6.25.2.9 get_shm_seg()

```
char* get_shm_seg (
            const key_t key,
            int & id )
```

Request and attach to, a shared memory segment with a specific key. The shared memory segment will be used to synchronize the command line interface and this liason process. (Note that the only difference between the shmget() of the Command Line Process and the Liaison Process is the lack of IPC_CREAT as one of the flags passed. IPC_CREAT will create a new fragment leaving it off only)

Parameters

key	The unique key required to access the specific shared memory segment This is passed as a parameter from the CLI to the Liason process via main() arguments
id	A reference to an integer in which to store the shared memory id that shmget() returns

Returns

A pointer to the shared memory segment

Exceptions

arboreal_liaison_error	

6.25.2.10 listen_for_client()

```
void listen_for_client (
            const int server_sock,
            const std::string server_sockpath )
```

Mark the server socket as open for buisness (i.e. capable of accepting connections) The Server can queue up X number of connection requests were X = Backlog

Parameters

server_sock	This server socket's identifier
server_sockpath	This server socket's pathname

Returns

VOID

Exceptions

arboreal_liaison_error	

6.25.2.11 pad_string()

```
std::string pad_string (
             const std::string string,
             const int size,
             const char value )
```

Pad the end of a std::string with X charachters where X is a chosen value and the charachter is also chosen.

Parameters

string	String to be padded
size	Number of charachters to pad the string with
value	What charachter to pad the string with

Returns

The padded string

6.25.2.12 recv_msg()

```
char* recv_msg (
             const int client_sock,
             const int size,
             const int flag,
             const int server_sock,
             const std::string server_sockpath,
             const std::string client_sockpath )
```

Receive a message from an accepted socket. (Note that the client/server pathnames and the server socket id are only used when an exception is thrown, in order to correctly close the socket)

Parameters

client_sock	The client socket's identifier
size	The size of the message to be received
flag	Any flags for the recv() function (see 'man recv')
server_sock	This server socket's identifier
server_sockpath	This server socket's pathname
client_sockpath	The client socket's pathname

Returns

A charachter array comprising the message received

Exceptions

arboreal_liaison_error	

6.25.2.13 seg_fault()

```
void seg_fault (
            int signal )
```

Remove socket files. Called whenever a SISEGIV is thrown

Parameters

signal	The sytem signal that was received

Returns

VOID

6.25.2.14 send_response()

```
void send_response (
            const int client_sock,
            const char * data,
            const int size,
            const int flag,
            const int server_sock,
            const std::string server_sockpath,
            const std::string client_sockpath )
```

Send a response to an accepted socket (Note that the client/server pathnames and the server socket id are only used when an exception is thrown in order to correctly close the socket)

Parameters

client_sock	The client socket's identifier
size	The size of the message to be received
flag	Any flags for the recv() function (see 'man recv')
server_sock	This server socket's identifier
server_sockpath	This server socket's pathname
client_sockpath	The client socket's pathname

Returns

VOID

Exceptions

arboreal_liaison_error	

6.25.2.15 set_up_socket()

```
int set_up_socket (
             std::string server_sockpath,
             struct sockaddr_un & server_sockaddr )
```

Set up a server socket to receive incoming connections

@ param server_sockpath: The pathname fo the server's socket (In this case the pathame will not be static, as each CLI process will fork its own Liaison process, therefore the server pathname is passed as an argument to the Liaison process' main() function)

Parameters

server_sockaddr	A reference to a standard structure whose components I will not describe here and can be viewed in a Unix manual. Suffice it to say, it stores the socket type and the socket path. (Note that the "type" of the struct is sockaddr_un signifing that this is a unix domain socket)

Returns

An integer, the socket ID

Exceptions

arboreal_liaison_error	

6.25.2.16 shutdown()

```
void shutdown (
             const int liaison_fid,
             const int client_sock,
             const std::string client_sockpath,
             const int liaison_sock,
             const std::string liaison_sockpath )
```

Perform proper cleanup when quit command or interrupt signal is received. This mainly involves closing all open connections and properly deleting any socket files on the system and finally, exiting the process via a call to exit().

Parameters

liaison_fid	ID of the [Liaison –> File System] Socket
client_sock	ID of the [Command Line –> Liaison] Socket
client_sockpath	The [Command Line –> Liaison] Socket's path
liaison_sock	ID of the [Liaison –> Command Line] Socket
liaison_sockpath	The [Liaison –> Command Line] Socket's path

Exceptions

arboreal_liaison_error	

6.25.2.17 unat_shm()

```
void unat_shm (
             const int shm_id,
             const char * shm )
```

Un-attach a shared memory segment from this process. (Process will not be able to access the shared memory segment until it is reattached)

Parameters

shm↩_id	The id of the shared memory segement that will be detatched
shm	The actual pointer to the shared memory segment

Returns

VOID

Exceptions

arboreal_liaison_error	

6.26 README.md File Reference

6.27 SharedCPPFiles/Arboreal_Exceptions.cpp File Reference

```
#include "../SharedHeaders/Arboreal_Exceptions.h"
```

6.28 SharedCPPFiles/Parser.cpp File Reference

```
#include "../SharedHeaders/Parser.h"
```

6.29 SharedHeaders/Arboreal_Exceptions.h File Reference

```
#include <string>
#include <stdexcept>
#include "ErrorCodes.h"
```

Classes

- class arboreal_exception
- class arboreal_runtime_error
- class arboreal_cli_error
- class arboreal_liaison_error
- class arboreal_daemon_error
- class disk_error
- class tag_error
- class file_error
- class arboreal_logic_error
- class invalid_arg

6.30 SharedHeaders/CommandCodes.h File Reference

Variables

- static const int FIND_TS = 400
- static const int FIND_FS = 401
- static const int NEW_FP = 300
- static const int NEW_TS = 301
- static const int NEW_FS = 302
- static const int DEL_FP = 500
- static const int DEL_TS = 501
- static const int DEL_FS = 502
- static const int OPEN_FP = 200
- static const int OPEN_F = 201
- static const int CLOSE_FP = 600
- static const int CLOSE_F = 601
- static const int RNAME_FP = 100
- static const int RNAME_TS = 101
- static const int RNAME_FS = 102
- static const int ATTR_FP = 700
- static const int ATTR_FS = 701
- static const int MERG_1_1 = 801
- static const int MERG_M_1 = 802
- static const int TAG_FP = 900

- static const int TAG_FS = 901
- static const int UTAG_FP = 1000
- static const int UTAG_FS = 1001
- static const int CD_ABS = 2222
- static const int CD_RLP = 1112
- static const int READ_XP = 3000
- static const int READ_FP = 3300
- static const int READ_XCWD = 3001
- static const int READ_FCWD = 3002
- static const int WRITE_FP = 4000
- static const int APPND_FP = 4400
- static const int WRITE_XFPF = 4440
- static const int APPND_XFPF = 4444
- static const int WRITE_FCWD = 4001
- static const int APPND_FCWD = 4002
- static const int WRITE_XFCWDF = 4003
- static const int APPND_XFCWDF = 4004
- static const int CPY_FP = 6000
- static const int CPY_FCWD = 6001
- static const int QUIT = 999
- static const int FTL_ERR = 9999
- static const int HANDSHK = 0
- static const int UHELP = 10001
- static const int UQUIT = 10002
- static const int UFIND = 10003
- static const int UNEW = 10004
- static const int UDEL = 10005
- static const int UOPEN = 10006
- static const int UCLOSE = 10007
- static const int URNAME = 10008
- static const int UATTR = 10009
- static const int UMERG = 10010
- static const int UTAG = 10011
- static const int UUTAG = 10012
- static const int UCD = 10013
- static const int UREAD = 10014
- static const int UWRITE = 10015
- static const int UCOPY = 10016

6.30.1 Variable Documentation

6.30.1.1 APPND_FCWD

```
const int APPND_FCWD = 4002  [static]
```

Append To File (In Current Working Directory)

6.30.1.2 APPND_FP

```
const int APPND_FP = 4400  [static]
```

Append To File (Must Supply File Path)

6.30.1.3 APPND_XFCWDF

```
const int APPND_XFCWDF = 4004  [static]
```

Append X Bytes From File To File (In Current Directory)

6.30.1.4 APPND_XFPF

```
const int APPND_XFPF = 4444  [static]
```

Append X Bytes From File To File (Must Supply File Paths)

6.30.1.5 ATTR_FP

```
const int ATTR_FP = 700  [static]
```

Get File Attributes (Must Supply File Path)

6.30.1.6 ATTR_FS

```
const int ATTR_FS = 701  [static]
```

Get File Attributes (In Current Working Directory)

6.30.1.7 CD_ABS

```
const int CD_ABS = 2222  [static]
```

Change Directory (Absolute Path)

6.30.1.8 CD_RLP

```
const int CD_RLP = 1112  [static]
```

Change Directory (Relative Path)

6.30.1.9 CLOSE_F

```
const int CLOSE_F = 601  [static]
```

Close A File (In Current Working Directory)

6.30.1.10 CLOSE_FP

```
const int CLOSE_FP = 600  [static]
```

Close A File (Must Supply File Path)

6.30.1.11 CPY_FCWD

```
const int CPY_FCWD = 6001  [static]
```

Copy Contents Of One File To Another (Overwrites File; In Current Working Directory

6.30.1.12 CPY_FP

```
const int CPY_FP = 6000  [static]
```

Copy Contents Of One File To Another (Overwrites File; Must Supply File Paths)

6.30.1.13 DEL_FP

```
const int DEL_FP = 500  [static]
```

Delete A File (Must Supply File Path)

6.30.1.14 DEL_FS

```
const int DEL_FS = 502  [static]
```

Delete A File(s) (In Current Working Directory)

6.30.1.15 DEL_TS

```
const int DEL_TS = 501  [static]
```

Delete A Tag(s) (Must Be Empty)

6.30.1.16 FIND_FS

```
const int FIND_FS = 401  [static]
```

Find Files By Name

6.30.1.17 FIND_TS

```
const int FIND_TS = 400  [static]
```

Find Files By Tag

6.30.1.18 FTL_ERR

```
const int FTL_ERR = 9999  [static]
```

Fatal Error

6.30.1.19 HANDSHK

```
const int HANDSHK = 0  [static]
```

Handshake

6.30.1.20 MERG_1_1

```
const int MERG_1_1 = 801  [static]
```

Merge One Tag Into Another

6.30.1.21 MERG_M_1

```
const int MERG_M_1 = 802  [static]
```

Merge Many Tags Into One

6.30.1.22 NEW_FP

```
const int NEW_FP = 300  [static]
```

Create A New File From Anywhere (Must Supply File Path)

6.30.1.23 NEW_FS

```
const int NEW_FS = 302  [static]
```

Create 1 Or More New Files Within The Current Working Directory

6.30.1.24 NEW_TS

```
const int NEW_TS = 301  [static]
```

Create 1 Or More New Tags

6.30.1.25 OPEN_F

```
const int OPEN_F = 201  [static]
```

Open A File (In Current Working Directory)

6.30.1.26 OPEN_FP

```
const int OPEN_FP = 200  [static]
```

Open A File For Operations (Must Supply File Path)

6.30.1.27 QUIT

```
const int QUIT = 999  [static]
```

Quit Interface

6.30.1.28 READ_FCWD

```
const int READ_FCWD = 3002  [static]
```

Read Whole File (In Current Working Directory)

6.30.1.29 READ_FP

```
const int READ_FP = 3300  [static]
```

Read Whole File (Must Supply Path)

6.30.1.30 READ_XCWD

```
const int READ_XCWD = 3001  [static]
```

Read X Bytes From File (In Current Working Directory)

6.30.1.31 READ_XP

```
const int READ_XP = 3000  [static]
```

Read X Bytes From File (Must Supply Path)

6.30.1.32 RNAME_FP

```
const int RNAME_FP = 100  [static]
```

Rename File(s) (Must Supply File Path)

6.30.1.33 RNAME_FS

```
const int RNAME_FS = 102  [static]
```

Rename File(s) (In Current Working Directory)

6.30.1.34 RNAME_TS

```
const int RNAME_TS = 101  [static]
```

Rename Tag(s)

6.30.1.35 TAG_FP

```
const int TAG_FP = 900  [static]
```

Tag File (Must Supply File Path)

6.30.1.36 TAG_FS

```
const int TAG_FS = 901  [static]
```

Tag File(s) (In Current Working Directory)

6.30.1.37 UATTR

```
const int UATTR = 10009  [static]
```

Usage Attributes

6.30.1.38 UCD

```
const int UCD = 10013  [static]
```

Usage Change Directory

6.30.1.39 UCLOSE

```
const int UCLOSE = 10007  [static]
```

Usage Close

6.30.1.40 UCOPY

```
const int UCOPY = 10016  [static]
```

Usage Copy

6.30.1.41 UDEL

```
const int UDEL = 10005  [static]
```

Usage Delete

6.30.1.42 UFIND

```
const int UFIND = 10003  [static]
```

Usage Find

6.30.1.43 UHELP

```
const int UHELP = 10001  [static]
```

Usage Help

6.30.1.44 UMERG

```
const int UMERG = 10010  [static]
```

Usage Merge

6.30.1.45 UNEW

```
const int UNEW = 10004  [static]
```

Usage New

6.30.1.46 UOPEN

```
const int UOPEN = 10006  [static]
```

Usage Open

6.30.1.47 UQUIT

```
const int UQUIT = 10002  [static]
```

Usage Quit

6.30.1.48 UREAD

```
const int UREAD = 10014  [static]
```

Usage Read

6.30.1.49 URNAME

```
const int URNAME = 10008  [static]
```

Usage Rename

6.30.1.50 UTAG

```
const int UTAG = 10011  [static]
```

Usage Tag

6.30.1.51 UTAG_FP

```
const int UTAG_FP = 1000  [static]
```

Untag File (Must Supply File Path)

6.30.1.52 UTAG_FS

```
const int UTAG_FS = 1001  [static]
```

Untag File(s) (In Current Working Directory)

6.30.1.53 UUTAG

```
const int UUTAG = 10012  [static]
```

Usage Untag

6.30.1.54 UWRITE

```
const int UWRITE = 10015  [static]
```

Usage Write

6.30.1.55 WRITE_FCWD

```
const int WRITE_FCWD = 4001  [static]
```

Write To File (In Current Working Directory)

6.30.1.56 WRITE_FP

```
const int WRITE_FP = 4000  [static]
```

Write To File (Must Supply File Path)

6.30.1.57 WRITE_XFCWDF

```
const int WRITE_XFCWDF = 4003  [static]
```

Write X Bytes From File To File (In Current Working Directory)

6.30.1.58 WRITE_XFPF

```
const int WRITE_XFPF = 4440  [static]
```

Write X Bytes From File To File (Must Supply File Paths)

6.31 SharedHeaders/CommandValidation.h File Reference

```
#include <regex>
#include "CommandCodes.h"
```

Functions

- std::regex change_dir ("cd (/[0-9a-zA-Z_]*)+")
- std::regex change_dir_rl ("cd \(/[0-9a-zA-Z_]+)+")
- std::regex usage_help ("--help")
- std::regex usage_quit ("--quit")
- std::regex usage_find ("--find")
- std::regex usage_new ("--new")
- std::regex usage_delete ("--delete")
- std::regex usage_open ("--open")
- std::regex usage_close ("--close")
- std::regex usage_rename ("--rename")
- std::regex usage_attr ("--attr")
- std::regex usage_merge ("--merge")
- std::regex usage_tag ("--tag")
- std::regex usage_untag ("--untag")
- std::regex usage_cd ("--cd")
- std::regex usage_read ("--read")
- std::regex usage_write ("--write")
- std::regex usage_copy ("--copy")
- std::regex help_1 ("-h --help")
- std::regex help_2 ("-h --quit")
- std::regex help_3 ("-h --find")
- std::regex help_4 ("-h --new")
- std::regex help_5 ("-h --delete")
- std::regex help_6 ("-h --open")
- std::regex help_7 ("-h --close")
- std::regex help_8 ("-h --rename")
- std::regex help_9 ("-h --attr")
- std::regex help_10 ("-h --merge")
- std::regex help_11 ("-h --tag")
- std::regex help_12 ("-h --untag")
- std::regex help_13 ("-h --cd")
- std::regex help_14 ("-h --read")
- std::regex help_15 ("-h --write")
- std::regex help_16 ("-h --copy")
- std::regex find_tags ("find -t [\\,0-9a-zA-Z_\\]*")
- std::regex find_files ("find -f \([0-9a-zA-Z_]+)(\[a-zA-Z]+)?(,([0-9a-zA-Z_]+)(\[0-9a-zA-Z_]+)?)*\")
- std::regex new_tags ("new -t \([0-9a-zA-Z_]+)(,[0-9a-zA-Z_]+)*\")

- std::regex new_files ("new -f \([0-9a-zA-Z_]+)(\[a-zA-Z]+)?(,([0-9a-zA-Z_]+)(\[0-9a-zA-Z_]+)?)∗\")
- std::regex new_file ("new (/[0-9a-zA-Z_]+)+[0-9a-zA-Z_]+((\)[a-zA-Z_]+)?")
- std::regex del_tags ("delete -t \([0-9a-zA-Z_]+)(,[0-9a-zA-Z_]+)∗\")
- std::regex del_files ("delete -f \([0-9a-zA-Z_]+)(\[a-zA-Z]+)?(,([0-9a-zA-Z_]+)(\[0-9a-zA-Z_]+)?)∗\")
- std::regex del_file ("delete (/[0-9a-zA-Z_]∗)∗/[0-9a-zA-Z]+(\[a-zA-Z]+)?")
- std::regex open_files ("open (-r|-w|-x) (/[0-9a-zA-Z_]+)+[0-9a-zA-Z_]+((\)[a-zA-Z_]+)?")
- std::regex open_file_cd ("open (-r|-w|-x) [0-9a-zA_Z]+(\[a-zA-Z]+)?")
- std::regex close_files ("close (/[0-9a-zA-Z_]+)+[0-9a-zA-Z_]+((\)[a-zA-Z_]+)?")
- std::regex close_file_cd ("close [0-9a-zA_Z]+(\[a-zA-Z]+)?")
- std::regex rename_tags ("rename -t \([0-9a-zA-Z_]+)(,[0-9a-zA-Z_]+)∗\ => \([0-9a-zA-Z_]+)(,[0-9a-zA-Z_↩]+)∗\")
- std::regex rename_files ("rename (/[0-9a-zA-Z_]∗)∗/[0-9a-zA-Z]+(\[a-zA-Z]+)? => [0-9a-zA-Z]+(\[a-zA-↩ Z]+)?")
- std::regex rename_file_cd ("rename [0-9a-zA_Z]+(\[a-zA-Z]+)? => [0-9a-zA_Z]+(\[a-zA-Z]+)?")
- std::regex get_attrs ("attr (/[0-9a-zA-Z_]∗)∗/[0-9a-zA-Z]+(\[a-zA-Z]+)?")
- std::regex get_attr_cd ("attr [0-9a-zA_Z]+(\[a-zA-Z]+)?")
- std::regex merge_1_1 ("merge [0-9a-zA-Z_]+ -> [0-9a-zA-Z_]+")
- std::regex merge_m_1 ("merge \([0-9a-zA-Z_]+)(,[0-9a-zA-Z_]+)∗\ -> [0-9a-zA-Z_]+[a-zA-Z_0-9]∗")
- std::regex add_tags ("tag (/[0-9a-zA-Z_]∗)∗/[0-9a-zA-Z]+(\[a-zA-Z]+)? \> \([0-9a-zA-Z_]+)(,[0-9a-zA-Z_]+)∗\")
- std::regex tag_files ("tag \([0-9a-zA-Z_]+)(\[a-zA-Z]+)?(,([0-9a-zA-Z_]+)(\[0-9a-zA-Z_]+)?)∗\ \> \([0-9a-zA-Z↩ _]+)(,[0-9a-zA-Z_]+)∗\")
- std::regex untag_file ("untag (/[0-9a-zA-Z_]∗)∗/[0-9a-zA-Z]+(\[a-zA-Z]+)? \> \([0-9a-zA-Z_]+)(,[0-9a-zA-Z_↩]+)∗\")
- std::regex untag_files ("untag \([0-9a-zA-Z_]+)(\[a-zA-Z]+)?(,([0-9a-zA-Z_]+)(\[0-9a-zA-Z_]+)?)∗\ \> \([0-9a-zA-Z_]+)(,[0-9a-zA-Z_]+)∗\")
- std::regex read_x_path ("read (/[0-9a-zA-Z_]+)+[0-9a-zA-Z_]+((\)[a-zA-Z_]+)? -b [0-9]+")
- std::regex read_x_cwd ("read [0-9a-zA-Z_]+((\)[a-zA-Z_]+)? -b [0-9]+")
- std::regex read_path ("read (/[0-9a-zA-Z_]+)+[0-9a-zA-Z_]+((\)[a-zA-Z_]+)?")
- std::regex read_cwd ("read [0-9a-zA-Z_]+((\)[a-zA-Z_]+)?")
- std::regex write_x_path ("write (/[0-9a-zA-Z_]+)+[0-9a-zA-Z_]+((\)[a-zA-Z_]+) -b [0-9]+")
- std::regex write_x_cwd ("write [0-9a-zA-Z_]+((\)[a-zA-Z_]+)? -b [0-9]")
- std::regex write_path ("")
- std::regex write_cwd ("")
- std::regex append_path ("")
- std::regex append_x_path ("")
- std::regex append_cwd ("")
- std::regex append_x_cwd ("")
- std::regex copy_path ("")
- std::regex copy_cwd ("")
- int check_command (std::string command)
- int check_usage (std::string input)
- int check_help (std::string input)

6.31.1 Function Documentation

6.31.1.1 add_tags()

```
std::regex add_tags (
            "tag (/[0-9a-zA-Z_]*)*/+(\-zA-Z]+)?  \ [0-9a-zA-Z],
            \([0-9a-zA-Z_]+)(, [0-9a-zA-Z_]+) *\"  )
```

Regex For File System "tag" Commands

6.31.1.2 append_cwd()

```
std::regex append_cwd (
             ""  )
```

6.31.1.3 append_path()

```
std::regex append_path (
             ""  )
```

6.31.1.4 append_x_cwd()

```
std::regex append_x_cwd (
             ""  )
```

6.31.1.5 append_x_path()

```
std::regex append_x_path (
             ""  )
```

6.31.1.6 change_dir()

```
std::regex change_dir (
             "cd (/[0-9a-zA-Z_]*)+"  )
```

General Regular Expression

- Relative Directory Change
- Absolute Directory Change
- Identifiying Correct Help Command Syntax

6.31.1.7 change_dir_rl()

```
std::regex change_dir_rl (
             "cd \[0-9a-zA-Z_]+)+"  )
```

6.31.1.8 check_command()

```
int check_command (
             std::string command )
```

6.31.1.9 check_help()

```
int check_help (
             std::string input )
```

6.31.1.10 check_usage()

```
int check_usage (
             std::string input )
```

6.31.1.11 close_file_cd()

```
std::regex close_file_cd (
             "close +(\-zA-Z]+)?" [0-9a-zA_Z] )
```

6.31.1.12 close_files()

```
std::regex close_files (
             "close (/[0-9a-zA-Z_]+)++((\a-zA-Z_]+)?" [0-9a-zA-Z_] )
```

Regex For File System "close" Commands

6.31.1.13 copy_cwd()

```
std::regex copy_cwd (
             ""  )
```

6.31.1.14 copy_path()

```
std::regex copy_path (
             ""  )
```

Regex For File System "copy" Commands Not Yet Available

6.31.1.15 del_file()

```
std::regex del_file (
             "delete (/[0-9a-zA-Z_]*)*/+(\-zA-Z]+)?" [0-9a-zA-Z] )
```

6.31.1.16 del_files()

```
std::regex del_files (
             "delete -f \0-9a-zA-Z_]+)(\-zA-Z]+)?(,([0-9a-zA-Z_]+)(\-9a-zA-Z_]+)?)*\  )
```

6.31.1.17 del_tags()

```
std::regex del_tags (
             "delete -t \0-9a-zA-Z_]+)(,[0-9a-zA-Z_]+)*\  )
```

Regex For File System "delete" Commands

6.31.1.18 find_files()

```
std::regex find_files (
             "find -f \0-9a-zA-Z_]+)(\-zA-Z]+)?(,([0-9a-zA-Z_]+)(\-9a-zA-Z_]+)?)*\  )
```

6.31.1.19 find_tags()

```
std::regex find_tags (
             "find -t *" [\\, 0-9a-zA-Z_\\] )
```

Regex For File System "find" Commands

6.31.1.20 get_attr_cd()

```
std::regex get_attr_cd (
             "attr +(\-zA-Z]+)?" [0-9a-zA_Z] )
```

6.31.1.21 get_attrs()

```
std::regex get_attrs (
             "attr (/[0-9a-zA-Z_]*)*/+(\-zA-Z]+)?" [0-9a-zA-Z] )
```

Regex For File System "attr" Commands

6.31.1.22 help_1()

```
std::regex help_1 (
             "-h --help"  )
```

6.31.1.23 help_10()

```
std::regex help_10 (
             "-h --merge"  )
```

6.31.1.24 help_11()

```
std::regex help_11 (
             "-h --tag"  )
```

6.31.1.25 help_12()

```
std::regex help_12 (
             "-h --untag"  )
```

6.31.1.26 help_13()

```
std::regex help_13 (
             "-h --cd"  )
```

6.31.1.27 help_14()

```
std::regex help_14 (
             "-h --read"  )
```

6.31.1.28 help_15()

```
std::regex help_15 (
             "-h --write"  )
```

6.31.1.29 help_16()

```
std::regex help_16 (
             "-h --copy"  )
```

6.31.1.30 help_2()

```
std::regex help_2 (
             "-h --quit"  )
```

6.31.1.31 help_3()

```
std::regex help_3 (
             "-h --find"  )
```

6.31.1.32 help_4()

```
std::regex help_4 (
             "-h --new"  )
```

6.31.1.33 help_5()

```
std::regex help_5 (
             "-h --delete"  )
```

6.31.1.34 help_6()

```
std::regex help_6 (
             "-h --open"  )
```

6.31.1.35 help_7()

```
std::regex help_7 (
             "-h --close"  )
```

6.31.1.36 help_8()

```
std::regex help_8 (
             "-h --rename"  )
```

6.31.1.37 help_9()

```
std::regex help_9 (
             "-h --attr"  )
```

6.31.1.38 merge_1_1()

```
std::regex merge_1_1 (
             "merge + -> +" [0-9a-zA-Z_][0-9a-zA-Z_] )
```

Regex For File System "merge" Commands Not Yet Available

6.31.1.39 merge_m_1()

```
std::regex merge_m_1 (
             "merge \0-9a-zA-Z_]+)(,[0-9a-zA-Z_]+)*\> +*" [0-9a-zA-Z_][a-zA-Z_0-9] )
```

6.31.1.40 new_file()

```
std::regex new_file (
             "new (/[0-9a-zA-Z_]+)++((\a-zA-Z_]+)?" [0-9a-zA-Z_] )
```

6.31.1.41 new_files()

```
std::regex new_files (
             "new -f \0-9a-zA-Z_]+)(\-zA-Z]+)?(,([0-9a-zA-Z_]+)(\-9a-zA-Z_]+)?)*\  )
```

6.31.1.42 new_tags()

```
std::regex new_tags (
             "new -t \0-9a-zA-Z_]+)(,[0-9a-zA-Z_]+)*\  )
```

Regex For File System "new" Commands

6.31.1.43 open_file_cd()

```
std::regex open_file_cd (
             "open (-r|-w|-x) +(\-zA-Z]+)?" [0-9a-zA_Z] )
```

6.31.1.44 open_files()

```
std::regex open_files (
             "open (-r|-w|-x) (/[0-9a-zA-Z_]+)++((\a-zA-Z_]+)?" [0-9a-zA-Z_] )
```

Regex For File System "open" Commands

6.31.1.45 read_cwd()

```
std::regex read_cwd (
             "read +((\a-zA-Z_]+)?" [0-9a-zA-Z_] )
```

6.31.1.46 read_path()

```
std::regex read_path (
             "read (/[0-9a-zA-Z_]+)++((\a-zA-Z_]+)?" [0-9a-zA-Z_] )
```

6.31.1.47 read_x_cwd()

```
std::regex read_x_cwd (
             "read +((\a-zA-Z_]+)?  -b +" [0-9a-zA-Z_][0-9] )
```

6.31.1.48 read_x_path()

```
std::regex read_x_path (
             "read (/[0-9a-zA-Z_]+)++((\a-zA-Z_]+)?  -b +" [0-9a-zA-Z_][0-9] )
```

Regex For File System "read" Commands Not Yet Available

6.31.1.49 rename_file_cd()

```
std::regex rename_file_cd (
             "rename +(\-zA-Z]+)?  [0-9a-zA_Z],
             [0-9a-zA_Z] +(\[a-zA-Z]+)?"  )
```

6.31.1.50 rename_files()

```
std::regex rename_files (
             "rename (/[0-9a-zA-Z_]*)*/+(\-zA-Z]+)?  [0-9a-zA-Z],
             [0-9a-zA-Z] +(\[a-zA-Z]+)?"  )
```

6.31.1.51 rename_tags()

```
std::regex rename_tags (
             "rename -t \0-9a-zA-Z_]+)(,[0-9a-zA-Z_]+)*\ ,
             \([0-9a-zA-Z_]+)(, [0-9a-zA-Z_]+) *\"  )
```

Regex For File System "rename" Commands

6.31.1.52 tag_files()

```
std::regex tag_files (
             "tag \0-9a-zA-Z_]+)(\-zA-Z]+)?(,([0-9a-zA-Z_]+)(\-9a-zA-Z_]+)?)*\ ,
             \([0-9a-zA-Z_]+)(, [0-9a-zA-Z_]+) *\"  )
```

6.31.1.53 untag_file()

```
std::regex untag_file (
             "untag (/[0-9a-zA-Z_]*)*/+(\-zA-Z]+)?  \ [0-9a-zA-Z],
             \([0-9a-zA-Z_]+)(, [0-9a-zA-Z_]+) *\"  )
```

Regex For File System "untag" Commands

6.31.1.54 untag_files()

```
std::regex untag_files (
             "untag \0-9a-zA-Z_]+)(\-zA-Z]+)?(,([0-9a-zA-Z_]+)(\-9a-zA-Z_]+)?)*\ ,
             \([0-9a-zA-Z_]+)(, [0-9a-zA-Z_]+) *\"  )
```

6.31.1.55 usage_attr()

```
std::regex usage_attr (
             "--attr"  )
```

6.31.1.56 usage_cd()

```
std::regex usage_cd (
             "--cd"  )
```

6.31.1.57 usage_close()

```
std::regex usage_close (
             "--close"  )
```

6.31.1.58 usage_copy()

```
std::regex usage_copy (
             "--copy"  )
```

6.31.1.59 usage_delete()

```
std::regex usage_delete (
             "--delete"  )
```

6.31.1.60 usage_find()

```
std::regex usage_find (
             "--find"  )
```

6.31.1.61 usage_help()

```
std::regex usage_help (
             "--help"  )
```

6.31.1.62 usage_merge()

```
std::regex usage_merge (
             "--merge"  )
```

6.31.1.63 usage_new()

```
std::regex usage_new (
             "--new"  )
```

6.31.1.64 usage_open()

```
std::regex usage_open (
             "--open"  )
```

6.31.1.65 usage_quit()

```
std::regex usage_quit (
             "--quit"  )
```

6.31.1.66 usage_read()

```
std::regex usage_read (
             "--read"  )
```

6.31.1.67 usage_rename()

```
std::regex usage_rename (
             "--rename"  )
```

6.31.1.68 usage_tag()

```
std::regex usage_tag (
             "--tag"  )
```

6.31.1.69 usage_untag()

```
std::regex usage_untag (
             "--untag"  )
```

6.31.1.70 usage_write()

```
std::regex usage_write (
             "--write"  )
```

6.31.1.71 write_cwd()

```
std::regex write_cwd (
             ""  )
```

6.31.1.72 write_path()

```
std::regex write_path (
             ""  )
```

6.31.1.73 write_x_cwd()

```
std::regex write_x_cwd (
             "write +((\a-zA-Z_]+)?  -b " [0-9a-zA-Z_][0-9] )
```

6.31.1.74 write_x_path()

```
std::regex write_x_path (
             "write (/[0-9a-zA-Z_]+)++((\a-zA-Z_]+) -b +" [0-9a-zA-Z_][0-9] )
```

Regex For File System "write" Commands Not Yet Available

6.32 SharedHeaders/DebugMessages.hpp File Reference

```
#include <map>
#include <string>
#include <iostream>
#include <fstream>
#include <mutex>
```

Classes

- class DebugMessages

Functions

- std::unique_lock< std::mutex > lk (m)

Variables

- std::mutex m

6.32.1 Function Documentation

6.32.1.1 lk()

```
std::unique_lock<std::mutex> lk (
            m )
```

6.32.2 Variable Documentation

6.32.2.1 m

```
std::mutex m
```

6.33 SharedHeaders/ErrorCodes.h File Reference

6.34 SharedHeaders/Parser.h File Reference

```
#include <string>
#include <iostream>
#include <vector>
#include "ErrorCodes.h"
#include "CommandCodes.h"
```

Classes

- class ParseError
- class Parser

Typedefs

- typedef unsigned int uint

6.34.1 Typedef Documentation

6.34.1.1 uint

```
typedef unsigned int uint
```

6.35 SharedHeaders/Print.h File Reference

```
#include "CommandValidation.h"
```

Functions

- void print_cmnd_lst ()
- void print_help ()
- void print_quit ()
- void print_find ()
- void print_new ()
- void print_del ()
- void print_open ()
- void print_close ()
- void print_rname ()
- void print_attr ()
- void print_merge ()
- void print_tag ()
- void print_utag ()
- void print_cd ()
- void print_read ()
- void print_write ()
- void print_copy ()
- void help ()
- void print_header ()
- void print_command (char ∗cmnd, int size)

  Print a command buffer.
- template< typename T >
  void print_vector (const std::vector< T > &vec)

6.35.1 Function Documentation

6.35.1.1 help()

```
void help ( )
```

Run helper applet

6.35.1.2 print_attr()

```
void print_attr ( )
```

Print usage for 'attr' command

6.35.1.3 print_cd()

```
void print_cd ( )
```

Print usage for 'cd' command

6.35.1.4 print_close()

```
void print_close ( )
```

Print usage for 'close' command

6.35.1.5 print_cmnd_lst()

```
void print_cmnd_lst ( )
```

Print a table of all of the available command archetypes

6.35.1.6 print_command()

```
void print_command (
             char * cmnd,
             int size )
```

Print a command buffer.

Because the command ID is saved as literral bytes (as opposed to the string representation) and std::cout does not print those well, the first X bytes of the C-String are skipped where X is the size of an integer

Parameters

cmnd	The command buffer as a C-String
size	The size of the command buffer (should always be whatever MaxBufferSize is although this is not strictly speaking mandatory)

6.35.1.7 print_copy()

```
void print_copy ( )
```

Print usage for 'copy' command

6.35.1.8 print_del()

```
void print_del ( )
```

Print usage for 'delete' command

6.35.1.9 print_find()

```
void print_find ( )
```

Print usage for 'find' command

6.35.1.10 print_header()

```
void print_header ( )
```

Print a welcome header

6.35.1.11 print_help()

```
void print_help ( )
```

Print usage for 'help' command

6.35.1.12 print_merge()

```
void print_merge ( )
```

Print usage for 'merge' command

6.35.1.13 print_new()

```
void print_new ( )
```

Print usage for 'new' command

6.35.1.14 print_open()

```
void print_open ( )
```

Print usage for 'open' command

6.35.1.15 print_quit()

```
void print_quit ( )
```

Print usage for 'quit' command

6.35.1.16 print_read()

```
void print_read ( )
```

Print usage for 'read' command

6.35.1.17 print_rname()

```
void print_rname ( )
```

Print usage for 'rename' command

6.35.1.18 print_tag()

```
void print_tag ( )
```

Print usage for 'tag' command

6.35.1.19 print_utag()

```
void print_utag ( )
```

Print usage for 'untag' command

6.35.1.20 print_vector()

```
template<typename T >
void print_vector (
             const std::vector< T > & vec )
```

Prints the contents of any vector as long as the contents of the vector can be piped to stdout

Parameters

vec	A referance to the vector to be printed

6.35.1.21 print_write()

```
void print_write ( )
```

Print usage for 'write' command

Index