

# Monster Mash

A UNIX-like shell and filesystem

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# 1 About

Monster Mash is a UNIX-like shell and virtual filesystem. Its name was originally MASH, which stood for Mohammad and Alok's SHell. This name was taken however, so we added the word monster, referencing the hit 1962 single by Bobby Pickett. It supports various simple commands similar to basic UNIX commands. The underlying filesystem is based on UNIX's inodes and data block structure.

# 2 Installation

The repository is available on Github (<https://github.com/ahota/monstermash>). To build Monster Mash, simply run `make`. This will create two executables, `mmash` and `client`.

# 3 Usage

The `mmash` executable will start the shell and filesystem. The following options are supported:

- `-s [port]`: Runs `mmash` as server on `[port]`. If port is not specified, `mmash` will default to port 1962 (the year *Monster Mash* was released as a single.)
- `-d`: Runs `mmash` in debug mode

Running `mmash` with no options starts it locally.

The following commands are supported by `mmash`:

- `mkfs`: Formats and (re)generates the filesystem. This is run automatically when starting `mmash` locally or when a client connects. This creates a root directory (`/`).
- `open <filename> <r|w|rw>`: Opens a file for reading (`r`), writing (`w`) or both (`rw`) depending on the flag given. If a file is opened with the `w` or `rw` flag and does not exist, it will be created. After a file is opened, a file descriptor is printed for later accesses.
- `read <fd> <size>`: Reads `size` bytes from an open file with file descriptor `fd`.
- `write <fd> <string>`: Writes `string` to an open file with file descriptor `fd`.
- `seek <fd> <offset>`: Seeks to `offset` (bytes) in file with file descriptor `fd`.
- `close <name>`: Closes file in the current directory called `name`.
- `mkdir <name>`: Makes a directory called `name` in the current directory. The name can have spaces if it's surrounded by quotes.
- `rmdir <name>`: Removes the directory called `name` from the current directory. The directory must be empty.
- `cd <path>`: Changes the current directory to `path`. Path must be relative and can have spaces if surrounded with quotes.
- `link <target> <link name>`: Creates a link called `link name` to `target`. Paths to link and target can be relative.
- `unlink <name>`: Unlinks a link called `name` or deletes a file called `name`. If the target data has zero links to it, it is deleted.
- `stat <name>`: Provides name on disk, inode ID, type, number of links, blocks allocated and the total data size of element called `name`.

- `ls`: Lists all elements in the current directory.
- `cat <name>`: Prints the contents of the file called `name`.
- `cp <src> <dest>`: Copies the file or link called `src` to a new file or link called `dest`. `src` and `dest` can be relative paths with spaces if surrounded by quotes
- `tree`: Lists the contents of all directories hierarchically from the current directory along with their total file size.
- `import <src> <dest>`: Imports a file called `src` from the host to a file called `dest` on the `mmash` filesystem.
- `export <src> <dest>`: Exports a file called `src` from `mmash` to the host filesystem as `dest`.

## 4 Architecture

Monster Mash's filesystem is based on concepts from a typical UNIX filesystem.

### 4.1 inodes

The filesystem uses inodes to keep a record of elements. Each element, whether it is a file, directory, or link, has one inode. Each inode is 8 bytes in size and has the following structure:

Type	Name	Size	Purpose
char	type	1	Type of element: 'f', 'd', or 'l'
short	id	2	Unique ID for this inode
int	first_block	4	Offset to the first block allocated for this element
char	pad	1	Padding to reach 8 bytes

The inode table supports up to 1024 inodes. Since each is 8 bytes, this means the inode table occupies only 8 kB of the disk.

### 4.2 Data Blocks

The first data block begins immediately after the inode table. Blocks are 4096 bytes each and have the following structure:

Type	Name	Size	Purpose
char *	name	32	The name of this element or 'CONTINUED'
int	next_block	32	Byte offset to next block or -1
short	link_count	2	Number of links to this element
char *	data	4058	Contents of this element

## 5 Limitations

Currently `mmash` supports 1024 inodes as a maximum. This means there cannot be more than 1024 elements on the filesystem, including the root directory. The total inode table size is 8KB. The disk itself is 100MB total, less the inode table and block meta-data size, leaves 99.06% of the disk for data.

In the current version, the filesystem is not persistent across runs and is erased every time `mmash` is started.