

```
1: // $Id: commands.h,v 1.8 2014-06-11 13:49:31-07 - - $
2:
3: #ifndef __COMMANDS_H__
4: #define __COMMANDS_H__
5:
6: #include <map>
7: using namespace std;
8:
9: #include "inode.h"
10: #include "util.h"
11:
12: //
13: // A couple of convenient usings to avoid verbosity.
14: //
15:
16: using command_fn = void (*)(inode_state& state, const wordvec& words);
17: using command_map = map<string,command_fn>;
18:
19: //
20: // commands -
21: //   A class to hold and dispatch each of the command functions.
22: //   Each command "foo" is interpreted by a command_fn fn_foo.
23: // ctor -
24: //   The default ctor initializes the map.
25: // operator[] -
26: //   Given a string, returns a command_fn associated with it,
27: //   or 0 if not found.
28: //
29:
30: class commands {
31:     private:
32:         commands (const inode&) = delete; // copy ctor
33:         commands& operator= (const inode&) = delete; // operator=
34:         command_map map;
35:     public:
36:         commands();
37:         command_fn at (const string& cmd);
38: };
39:
```

```
40:
41: //
42: // execution functions -
43: //     See the man page for a description of each of these functions.
44: //
45:
46: void fn_cat      (inode_state& state, const wordvec& words);
47: void fn_cd      (inode_state& state, const wordvec& words);
48: void fn_echo    (inode_state& state, const wordvec& words);
49: void fn_exit    (inode_state& state, const wordvec& words);
50: void fn_ls      (inode_state& state, const wordvec& words);
51: void fn_lsr     (inode_state& state, const wordvec& words);
52: void fn_make    (inode_state& state, const wordvec& words);
53: void fn_mkdir   (inode_state& state, const wordvec& words);
54: void fn_prompt  (inode_state& state, const wordvec& words);
55: void fn_pwd     (inode_state& state, const wordvec& words);
56: void fn_rm      (inode_state& state, const wordvec& words);
57: void fn_rmr     (inode_state& state, const wordvec& words);
58:
59: //
60: // exit_status_message -
61: //     Prints an exit message and returns the exit status, as recorded
62: //     by any of the functions.
63: //
64:
65: int exit_status_message();
66: class ysh_exit_exn: public exception {};
67:
68: #endif
69:
```



```
34:
35: //
36: // DEBUGF -
37: //     Macro which expands into trace code.  First argument is a
38: //     trace flag char, second argument is output code that can
39: //     be sandwiched between <<.  Beware of operator precedence.
40: //     Example:
41: //         DEBUGF ('u', "foo = " << foo);
42: //     will print two words and a newline if flag 'u' is on.
43: //     Traces are preceded by filename, line number, and function.
44: //
45:
46: #ifdef NDEBUG
47: #define DEBUGF(FLAG, CODE) ;
48: #define DEBUGS(FLAG, STMT) ;
49: #else
50: #define DEBUGF(FLAG, CODE) { \
51:     if (debugflags::getflag (FLAG)) { \
52:         debugflags::where (FLAG, __FILE__, __LINE__, __func__); \
53:         cerr << CODE << endl; \
54:     } \
55: }
56: #define DEBUGS(FLAG, STMT) { \
57:     if (debugflags::getflag (FLAG)) { \
58:         debugflags::where (FLAG, __FILE__, __LINE__, __func__); \
59:         STMT; \
60:     } \
61: }
62: #endif
63:
64: #endif
65:
```

```
1: // $Id: inode.h,v 1.13 2014-06-12 18:10:25-07 - - $
2:
3: #ifndef __INODE_H__
4: #define __INODE_H__
5:
6: #include <exception>
7: #include <iostream>
8: #include <memory>
9: #include <map>
10: #include <vector>
11: using namespace std;
12:
13: #include "util.h"
14:
15: //
16: // inode_t -
17: //     An inode is either a directory or a plain file.
18: //
19:
20: enum inode_t {PLAIN_INODE, DIR_INODE};
21: class inode;
22: class file_base;
23: class plain_file;
24: class directory;
25: using inode_ptr = shared_ptr<inode>;
26: using file_base_ptr = shared_ptr<file_base>;
27: using plain_file_ptr = shared_ptr<plain_file>;
28: using directory_ptr = shared_ptr<directory>;
29:
30: //
31: // inode_state -
32: //     A small convenient class to maintain the state of the simulated
33: //     process: the root (/), the current directory (.), and the
34: //     prompt.
35: //
36:
37: class inode_state {
38:     friend class inode;
39:     friend ostream& operator<< (ostream& out, const inode_state&);
40:     private:
41:         inode_state (const inode_state&) = delete; // copy ctor
42:         inode_state& operator= (const inode_state&) = delete; // op=
43:         inode_ptr root {nullptr};
44:         inode_ptr cwd {nullptr};
45:         string prompt {"% "};
46:     public:
47:         inode_state();
48: };
49:
```

```
50:
51: //
52: // class inode -
53: //
54: // inode ctor -
55: //     Create a new inode of the given type.
56: // get_inode_nr -
57: //     Retrieves the serial number of the inode. Inode numbers are
58: //     allocated in sequence by small integer.
59: // size -
60: //     Returns the size of an inode. For a directory, this is the
61: //     number of dirents. For a text file, the number of characters
62: //     when printed (the sum of the lengths of each word, plus the
63: //     number of words.
64: //
65:
66: class inode {
67:     friend class inode_state;
68:     private:
69:         static int next_inode_nr;
70:         int inode_nr;
71:         inode_t type;
72:         file_base_ptr contents;
73:     public:
74:         inode (inode_t init_type);
75:         int get_inode_nr() const;
76: };
77:
78: //
79: // class file_base -
80: //
81: // Just a base class at which an inode can point. No data or
82: // functions. Makes the synthesized members useable only from
83: // the derived classes.
84: //
85:
86: class file_base {
87:     protected:
88:         file_base () = default;
89:         file_base (const file_base&) = default;
90:         file_base (file_base&&) = default;
91:         file_base& operator= (const file_base&) = default;
92:         file_base& operator= (file_base&&) = default;
93:         virtual ~file_base () = default;
94:         virtual size_t size() const = 0;
95:     public:
96:         friend plain_file_ptr plain_file_ptr_of (file_base_ptr);
97:         friend directory_ptr directory_ptr_of (file_base_ptr);
98: };
99:
```

```
100:
101: //
102: // class plain_file -
103: //
104: // Used to hold data.
105: // synthesized default ctor -
106: //     Default vector<string> is a an empty vector.
107: // readfile -
108: //     Returns a copy of the contents of the wordvec in the file.
109: //     Throws an yshell_exn for a directory.
110: // writefile -
111: //     Replaces the contents of a file with new contents.
112: //     Throws an yshell_exn for a directory.
113: //
114:
115: class plain_file: public file_base {
116:     private:
117:         wordvec data;
118:     public:
119:         size_t size() const override;
120:         const wordvec& readfile() const;
121:         void writefile (const wordvec& newdata);
122: };
123:
124: //
125: // class directory -
126: //
127: // Used to map filenames onto inode pointers.
128: // default ctor -
129: //     Creates a new map with keys "." and "..".
130: // remove -
131: //     Removes the file or subdirectory from the current inode.
132: //     Throws an yshell_exn if this is not a directory, the file
133: //     does not exist, or the subdirectory is not empty.
134: //     Here empty means the only entries are dot (.) and dotdot (..).
135: // mkdir -
136: //     Creates a new directory under the current directory and
137: //     immediately adds the directories dot (.) and dotdot (..) to it.
138: //     Note that the parent (..) of / is / itself. It is an error
139: //     if the entry already exists.
140: // mkfile -
141: //     Create a new empty text file with the given name. Error if
142: //     a dirent with that name exists.
143:
144: class directory: public file_base {
145:     private:
146:         map<string,inode_ptr> dirents;
147:     public:
148:         size_t size() const override;
149:         void remove (const string& filename);
150:         inode& mkdir (const string& dirname);
151:         inode& mkfile (const string& filename);
152: };
153:
154: #endif
155:
```

```
1: // $Id: util.h,v 1.9 2014-06-12 16:44:08-07 - - $
2:
3: //
4: // util -
5: //     A utility class to provide various services not conveniently
6: //     included in other modules.
7: //
8:
9: #ifndef __UTIL_H__
10: #define __UTIL_H__
11:
12: #include <iostream>
13: #include <stdexcept>
14: #include <string>
15: #include <vector>
16: using namespace std;
17:
18: //
19: // Convenient type using to allow brevity of code elsewhere.
20: //
21:
22: using wordvec = vector<string>;
23:
24: //
25: // yshell_exn -
26: //     Extend runtime_error for throwing exceptions related to this
27: //     program.
28: //
29:
30: class yshell_exn: public runtime_error {
31:     public:
32:         explicit yshell_exn (const string& what);
33: };
34:
35: //
36: // setexecname -
37: //     Sets the static string to be used as an execname.
38: // execname -
39: //     Returns the basename of the executable image, which is used in
40: //     printing error messages.
41: //
42:
43: void execname (const string&);
44: string& execname();
45:
```



```
46:
47: //
48: // want_echo -
49: //     We want to echo all of cin to cout if either cin or cout
50: //     is not a tty. This helps make batch processing easier by
51: //     making cout look like a terminal session trace.
52: //
53:
54: bool want_echo();
55:
56: //
57: // exit_status -
58: //     A static class for maintaining the exit status. The default
59: //     status is EXIT_SUCCESS (0), but can be set to another value,
60: //     such as EXIT_FAILURE (1) to indicate that error messages have
61: //     been printed.
62: //
63:
64: class exit_status {
65:     private:
66:         static int status;
67:     public:
68:         static void set (int);
69:         static int get();
70: };
71:
72: //
73: // split -
74: //     Split a string into a wordvec (as defined above). Any sequence
75: //     of chars in the delimiter string is used as a separator. To
76: //     Split a pathname, use "/". To split a shell command, use " ".
77: //
78:
79: wordvec split (const string& line, const string& delimiter);
80:
81: // complain -
82: //     Used for starting error messages. Sets the exit status to
83: //     EXIT_FAILURE, writes the program name to cerr, and then
84: //     returns the cerr ostream. Example:
85: //         complain() << filename << ": some problem" << endl;
86: //
87:
88: ostream& complain();
89:
```

```
90:
91: //
92: // operator<< (vector) -
93: //   An overloaded template operator which allows vectors to be
94: //   printed out as a single operator, each element separated from
95: //   the next with spaces. The item_t must have an output operator
96: //   defined for it.
97: //
98:
99: template <typename item_t>
100: ostream& operator<< (ostream& out, const vector<item_t>& vec) {
101:     string space = "";
102:     for (const auto& item: vec) {
103:         out << space << item;
104:         space = " ";
105:     }
106:     return out;
107: }
108:
109: #endif
110:
```

```
1: // $Id: commands.cpp,v 1.11 2014-06-11 13:49:31-07 - - $
2:
3: #include "commands.h"
4: #include "debug.h"
5:
6: commands::commands(): map ({
7:     {"cat"      , fn_cat    },
8:     {"cd"       , fn_cd     },
9:     {"echo"     , fn_echo   },
10:    {"exit"      , fn_exit   },
11:    {"ls"        , fn_ls     },
12:    {"lsr"       , fn_lsr    },
13:    {"make"      , fn_make   },
14:    {"mkdir"     , fn_mkdir  },
15:    {"prompt"    , fn_prompt },
16:    {"pwd"       , fn_pwd    },
17:    {"rm"        , fn_rm     },
18: }) {}
19:
20: command_fn commands::at (const string& cmd) {
21:     // Note: value_type is pair<const key_type, mapped_type>
22:     // So: iterator->first is key_type (string)
23:     // So: iterator->second is mapped_type (command_fn)
24:     command_map::const_iterator result = map.find (cmd);
25:     if (result == map.end()) {
26:         throw yshell_exn (cmd + ": no such function");
27:     }
28:     return result->second;
29: }
30:
```

```
31:
32: void fn_cat (inode_state& state, const wordvec& words){
33:     DEBUGF ('c', state);
34:     DEBUGF ('c', words);
35: }
36:
37: void fn_cd (inode_state& state, const wordvec& words){
38:     DEBUGF ('c', state);
39:     DEBUGF ('c', words);
40: }
41:
42: void fn_echo (inode_state& state, const wordvec& words){
43:     DEBUGF ('c', state);
44:     DEBUGF ('c', words);
45: }
46:
47: void fn_exit (inode_state& state, const wordvec& words){
48:     DEBUGF ('c', state);
49:     DEBUGF ('c', words);
50:     throw ysh_exit_exn();
51: }
52:
53: void fn_ls (inode_state& state, const wordvec& words){
54:     DEBUGF ('c', state);
55:     DEBUGF ('c', words);
56: }
57:
58: void fn_lsr (inode_state& state, const wordvec& words){
59:     DEBUGF ('c', state);
60:     DEBUGF ('c', words);
61: }
62:
```

```
63:
64: void fn_make (inode_state& state, const wordvec& words){
65:     DEBUGF ('c', state);
66:     DEBUGF ('c', words);
67: }
68:
69: void fn_mkdir (inode_state& state, const wordvec& words){
70:     DEBUGF ('c', state);
71:     DEBUGF ('c', words);
72: }
73:
74: void fn_prompt (inode_state& state, const wordvec& words){
75:     DEBUGF ('c', state);
76:     DEBUGF ('c', words);
77: }
78:
79: void fn_pwd (inode_state& state, const wordvec& words){
80:     DEBUGF ('c', state);
81:     DEBUGF ('c', words);
82: }
83:
84: void fn_rm (inode_state& state, const wordvec& words){
85:     DEBUGF ('c', state);
86:     DEBUGF ('c', words);
87: }
88:
89: void fn_rmr (inode_state& state, const wordvec& words){
90:     DEBUGF ('c', state);
91:     DEBUGF ('c', words);
92: }
93:
94: int exit_status_message() {
95:     int exit_status = exit_status::get();
96:     cout << execname() << ": exit(" << exit_status << ")" << endl;
97:     return exit_status;
98: }
99:
```

```
1: // $Id: debug.cpp,v 1.8 2015-01-02 18:13:23-08 - - $
2:
3: #include <climits>
4: #include <iostream>
5: #include <vector>
6:
7: using namespace std;
8:
9: #include "debug.h"
10: #include "util.h"
11:
12: debugflags::flagset debugflags::flags {};
13:
14: void debugflags::setflags (const string& initflags) {
15:     for (const unsigned char flag: initflags) {
16:         if (flag == '@') flags.set();
17:         else flags.set (flag, true);
18:     }
19: }
20:
21: //
22: // getflag -
23: //     Check to see if a certain flag is on.
24: //
25:
26: bool debugflags::getflag (char flag) {
27:     // WARNING: Don't TRACE this function or the stack will blow up.
28:     return flags.test (static_cast<unsigned char> (flag));
29: }
30:
31: void debugflags::where (char flag, const char* file, int line,
32:                        const char* func) {
33:     cout << execname() << ": DEBUG(" << flag << ") "
34:          << file << "[" << line << "]" " << func << "()" << endl;
35: }
36:
```

```
1: // $Id: inode.cpp,v 1.12 2014-07-03 13:29:57-07 - - $
2:
3: #include <iostream>
4: #include <stdexcept>
5:
6: using namespace std;
7:
8: #include "debug.h"
9: #include "inode.h"
10:
11: int inode::next_inode_nr {1};
12:
13: inode::inode(inode_t init_type):
14:     inode_nr (next_inode_nr++), type (init_type)
15: {
16:     switch (type) {
17:         case PLAIN_INODE:
18:             contents = make_shared<plain_file>();
19:             break;
20:         case DIR_INODE:
21:             contents = make_shared<directory>();
22:             break;
23:     }
24:     DEBUGF ('i', "inode " << inode_nr << ", type = " << type);
25: }
26:
27: int inode::get_inode_nr() const {
28:     DEBUGF ('i', "inode = " << inode_nr);
29:     return inode_nr;
30: }
31:
32: plain_file_ptr plain_file_ptr_of (file_base_ptr ptr) {
33:     plain_file_ptr pfptr = dynamic_pointer_cast<plain_file> (ptr);
34:     if (pfptr == nullptr) throw invalid_argument ("plain_file_ptr_of");
35:     return pfptr;
36: }
37:
38: directory_ptr directory_ptr_of (file_base_ptr ptr) {
39:     directory_ptr dirptr = dynamic_pointer_cast<directory> (ptr);
40:     if (dirptr == nullptr) throw invalid_argument ("directory_ptr_of");
41:     return dirptr;
42: }
43:
```

```
44:
45: size_t plain_file::size() const {
46:     size_t size {0};
47:     DEBUGF ('i', "size = " << size);
48:     return size;
49: }
50:
51: const wordvec& plain_file::readfile() const {
52:     DEBUGF ('i', data);
53:     return data;
54: }
55:
56: void plain_file::writefile (const wordvec& words) {
57:     DEBUGF ('i', words);
58: }
59:
60: size_t directory::size() const {
61:     size_t size {0};
62:     DEBUGF ('i', "size = " << size);
63:     return size;
64: }
65:
66: void directory::remove (const string& filename) {
67:     DEBUGF ('i', filename);
68: }
69:
70: inode_state::inode_state() {
71:     DEBUGF ('i', "root = " << root << ", cwd = " << cwd
72:         << ", prompt = \"" << prompt << "\"");
73: }
74:
75: ostream& operator<< (ostream& out, const inode_state& state) {
76:     out << "inode_state: root = " << state.root
77:         << ", cwd = " << state.cwd;
78:     return out;
79: }
80:
```



```
1: // $Id: util.cpp,v 1.10 2014-06-11 13:34:25-07 - - $
2:
3: #include <cstdlib>
4: #include <unistd.h>
5:
6: using namespace std;
7:
8: #include "util.h"
9: #include "debug.h"
10:
11: yshell_exn::yshell_exn (const string& what): runtime_error (what) {
12: }
13:
14: int exit_status::status = EXIT_SUCCESS;
15: static string execname_string;
16:
17: void exit_status::set (int new_status) {
18:     status = new_status;
19: }
20:
21: int exit_status::get() {
22:     return status;
23: }
24:
25: void execname (const string& name) {
26:     execname_string = name.substr (name.rfind ('/') + 1);
27:     DEBUGF ('u', execname_string);
28: }
29:
30: string& execname() {
31:     return execname_string;
32: }
33:
34: bool want_echo() {
35:     constexpr int CIN_FD {0};
36:     constexpr int COUT_FD {1};
37:     bool cin_is_not_a_tty = not isatty (CIN_FD);
38:     bool cout_is_not_a_tty = not isatty (COUT_FD);
39:     DEBUGF ('u', "cin_is_not_a_tty = " << cin_is_not_a_tty
40:         << ", cout_is_not_a_tty = " << cout_is_not_a_tty);
41:     return cin_is_not_a_tty or cout_is_not_a_tty;
42: }
43:
```

```
44:
45: wordvec split (const string& line, const string& delimiters) {
46:     wordvec words;
47:     size_t end = 0;
48:
49:     // Loop over the string, splitting out words, and for each word
50:     // thus found, append it to the output wordvec.
51:     for (;;) {
52:         size_t start = line.find_first_not_of (delimiters, end);
53:         if (start == string::npos) break;
54:         end = line.find_first_of (delimiters, start);
55:         words.push_back (line.substr (start, end - start));
56:     }
57:     DEBUGF ('u', words);
58:     return words;
59: }
60:
61: ostream& complain() {
62:     exit_status::set (EXIT_FAILURE);
63:     cerr << execname() << ": ";
64:     return cerr;
65: }
66:
```

```
1: // $Id: main.cpp,v 1.3 2014-06-11 13:52:31-07 - - $
2:
3: #include <cstdlib>
4: #include <iostream>
5: #include <string>
6: #include <utility>
7: #include <unistd.h>
8:
9: using namespace std;
10:
11: #include "commands.h"
12: #include "debug.h"
13: #include "inode.h"
14: #include "util.h"
15:
16: //
17: // scan_options
18: // Options analysis: The only option is -Dflags.
19: //
20:
21: void scan_options (int argc, char** argv) {
22:     opterr = 0;
23:     for (;;) {
24:         int option = getopt (argc, argv, "@:");
25:         if (option == EOF) break;
26:         switch (option) {
27:             case '@':
28:                 debugflags::setflags (optarg);
29:                 break;
30:             default:
31:                 complain() << "-" << (char) option << ": invalid option"
32:                     << endl;
33:                 break;
34:         }
35:     }
36:     if (optind < argc) {
37:         complain() << "operands not permitted" << endl;
38:     }
39: }
40:
```

```
41:
42: //
43: // main -
44: //     Main program which loops reading commands until end of file.
45: //
46:
47: int main (int argc, char** argv) {
48:     execname (argv[0]);
49:     cout << boolalpha; // Print false or true instead of 0 or 1.
50:     cerr << boolalpha;
51:     cout << argv[0] << " build " << __DATE__ << " " << __TIME__ << endl;
52:     scan_options (argc, argv);
53:     bool need_echo = want_echo();
54:     commands cmdmap;
55:     string prompt = "%";
56:     inode_state state;
57:     try {
58:         for (;;) {
59:             try {
60:
61:                 // Read a line, break at EOF, and echo print the prompt
62:                 // if one is needed.
63:                 cout << prompt << " ";
64:                 string line;
65:                 getline (cin, line);
66:                 if (cin.eof()) {
67:                     if (need_echo) cout << "^D";
68:                     cout << endl;
69:                     DEBUGF ('y', "EOF");
70:                     break;
71:                 }
72:                 if (need_echo) cout << line << endl;
73:
74:                 // Split the line into words and lookup the appropriate
75:                 // function. Complain or call it.
76:                 wordvec words = split (line, " \t");
77:                 DEBUGF ('y', "words = " << words);
78:                 command_fn fn = cmdmap.at(words.at(0));
79:                 fn (state, words);
80:             } catch (yshell_exn& exn) {
81:                 // If there is a problem discovered in any function, an
82:                 // exn is thrown and printed here.
83:                 complain() << exn.what() << endl;
84:             }
85:         }
86:     } catch (ysh_exit_exn& ) {
87:         // This catch intentionally left blank.
88:     }
89:
90:     return exit_status_message();
91: }
92:
```

```
1: # $Id: Makefile,v 1.14 2014-06-25 17:42:27-07 - - $
2:
3: MKFILE      = Makefile
4: DEFILE      = ${MKFILE}.dep
5: NOINCL      = ci clean spotless
6: NEEDINCL    = ${filter ${NOINCL}, ${MAKECMDGOALS}}
7: GMAKE       = ${MAKE} --no-print-directory
8:
9: COMPILECPP   = g++ -g -O0 -Wall -Wextra -rdynamic -std=gnu++11
10: MAKEDEPCPP  = g++ -MM
11:
12: CPPSOURCE    = commands.cpp debug.cpp inode.cpp util.cpp main.cpp
13: CPPHEADER    = commands.h debug.h inode.h util.h
14: EXECBIN      = yshell
15: OBJECTS      = ${CPPSOURCE:.cpp=.o}
16: OTHERS       = ${MKFILE} README
17: ALLSOURCES   = ${CPPHEADER} ${CPPSOURCE} ${OTHERS}
18: LISTING      = Listing.ps
19:
20: all : ${EXECBIN}
21:     - checksource ${ALLSOURCES}
22:
23: ${EXECBIN} : ${OBJECTS}
24:     ${COMPILECPP} -o $@ ${OBJECTS}
25:
26: %.o : %.cpp
27:     ${COMPILECPP} -c $<
28:
29: ci : ${ALLSOURCES}
30:     cid + ${ALLSOURCES}
31:     - checksource ${ALLSOURCES}
32:
33: lis : ${ALLSOURCES}
34:     mkpspdf ${LISTING} ${ALLSOURCES} ${DEFILE}
35:
36: clean :
37:     - rm ${OBJECTS} ${DEFILE} core ${EXECBIN}.errs
38:
39: spotless : clean
40:     - rm ${EXECBIN} ${LISTING} ${LISTING:.ps=.pdf}
41:
42: dep : ${CPPSOURCE} ${CPPHEADER}
43:     @ echo "# ${DEFILE} created `LC_TIME=C date`" >${DEFILE}
44:     ${MAKEDEPCPP} ${CPPSOURCE} >>${DEFILE}
45:
46: ${DEFILE} : ${MKFILE}
47:     @ touch ${DEFILE}
48:     ${GMAKE} dep
49:
50: again :
51:     ${GMAKE} spotless dep ci all lis
52:
53: ifeq (${NEEDINCL}, )
54: include ${DEFILE}
55: endif
56:
```

```
1: $Id: README,v 1.1 2013-06-18 17:32:08-07 - - $
```

```
1: # Makefile.dep created Fri Jan  2 18:13:26 PST 2015
2: commands.o: commands.cpp commands.h inode.h util.h debug.h
3: debug.o: debug.cpp debug.h util.h
4: inode.o: inode.cpp debug.h inode.h util.h
5: util.o: util.cpp util.h debug.h
6: main.o: main.cpp commands.h inode.h util.h debug.h
```