```
 1: // $Id: listmap.h,v 1.29 2021-05-22 02:29:26-07 - - $
 2: //Kai O'Brien (kimobrie@ucsc.edu)
 3:
 4: #ifndef __LISTMAP_H__
 5: #define __LISTMAP_H__
 6:
 7: #include "debug.h"
 8: #include "xless.h"
 9: #include "xpair.h"
10:
11: #define SHOW_LINK(FLAG,PTR) { \
12:            DEBUGB (FLAG, #PTR << "=" << PTR \
13:                    << ": next=" << PTR->next \
14:                    << ", prev=" << PTR->prev); \
15:         }
16:
17: template <typename key_t, typename mapped_t, class less_t=xless<key_t>>
18: class listmap {
19:    public:
20:       using key_type = key_t;
21:       using mapped_type = mapped_t;
22:       using value_type = xpair<const key_type, mapped_type>;
23:    private:
24:       less_t less;
25:       struct node;
26:       struct link {
27:          node* next{};
28:          node* prev{};
29:          link (node* next_, node* prev_): next(next_), prev(prev_){}
30:       };
31:       struct node: link {
32:          value_type value{};
33:          node (node* next_, node* prev_, const value_type& value_):
34:                link (next_, prev_), value(value_){}
35:       };
36:       node* anchor() { return static_cast<node*> (&anchor_); }
37:       link anchor_ {anchor(), anchor()};
38:    public:
39:       class iterator;
40:       listmap(){};
41:       listmap (const listmap&);
42:       listmap& operator= (const listmap&);
43:       ~listmap();
44:       iterator insert (const value_type&);
45:       iterator find (const key_type&);
46:       iterator erase (iterator position);
47:       iterator begin() { return anchor()->next; }
48:       iterator end() { return anchor(); }
49:       bool empty() const { return anchor_.next == &anchor_; }
50:       operator bool() const { return not empty(); }
51: };
52:
```

```
53:
54: template <typename key_t, typename mapped_t, class less_t>
55: class listmap<key_t,mapped_t,less_t>::iterator {
56:    friend class listmap<key_t,mapped_t,less_t>;
57:    private:
58:       listmap<key_t,mapped_t,less_t>::node* where {nullptr};
59:       iterator (node* where_): where(where_){};
60:    public:
61:       iterator() {}
62:       value_type& operator*() {
63:          SHOW_LINK ('b', where);
64:          return where->value;
65:       }
66:       value_type* operator->() { return &(where->value); }
67:       iterator& operator++() { where = where->next; return *this; }
68:       iterator& operator--() { where = where->prev; return *this; }
69:       bool operator== (const iterator& that) const {
70:          return this->where == that.where;
71:       }
72:       bool operator!= (const iterator& that) const {
73:          return this->where != that.where;
74:       }
75:       operator bool() const { return where != nullptr; }
76: };
77:
78: #include "listmap.tcc"
79: #endif
80:
```

```
 1: // $Id: listmap.tcc,v 1.19 2021-05-22 20:46:04-07 - - $
 2: //Kai O'Brien (kimobrie@ucsc.edu)
 3:
 4: #include "listmap.h"
 5: #include "debug.h"
 6:
 7: //
 8: /////////////////////////////////////////////////////////////////
 9: // Operations on listmap.
10: /////////////////////////////////////////////////////////////////
11: //
12: //do ~ insert find and erase + main
13:
14: //
15: // listmap::~listmap()
16: //
17: template <typename key_t, typename mapped_t, class less_t>
18: listmap<key_t,mapped_t,less_t>::~listmap() {
19:    DEBUGF ('l', reinterpret_cast<const void*> (this));
20:    //typical double linked list deconstructor
21:    //begin() is the "head"
22:    //DONT DELETE ANCHOR!
23:    node* temp1 = begin().where;//or just do anchor().next
24:    node* temp2;
25:    while(temp1!=anchor()){
26:       temp2 = temp1;
27:       temp1 = temp1->next;
28:       delete temp2;
29:      // erase(temp2);
30:    }
31: }
32:
33: //
34: // iterator listmap::insert (const value_type&)
35: //
36: template <typename key_t, typename mapped_t, class less_t>
37: typename listmap<key_t,mapped_t,less_t>::iterator
38: listmap<key_t,mapped_t,less_t>::insert (const value_type& pair) {
39:    DEBUGF ('l', &pair << "->" << pair);
40:    //if empty
41:    if(empty()){
42:       node *empty_node = new node(anchor(),anchor(),pair);
43:       anchor_.next = empty_node;
44:       anchor_.prev = empty_node;
45:       return iterator(empty_node);
46:    }
47:    //otherwise
48:    //if key is already there, the value is replaced
49:     node *new_node = new node(nullptr,nullptr,pair);
50:    for (auto itor = begin(); itor != end(); ++itor) {
51:          //if the itr is == key, update value
52:       if(!less(itor->first,pair.first) &&
53:          !less(pair.first,itor->first)) {
54:          itor->second = pair.second;//?? maybe
55:          return itor;
56:       }
57:          //if  pair.first is >= itor, not less than itor
58:       else if(!less(pair.first,itor->first)){
```

```
 59:             //at the end of the list, pair.first is greater
 60:            // than the end, what to do
 61:           new_node->next = itor.where->next;
 62:           new_node->prev = itor.where;
 63:           if(itor.where->next!=nullptr){
 64:              itor.where->next->prev = new_node;
 65:           }
 66:           itor.where->next = new_node;
 67:           break;
 68:        }
 69:    }
 70:
 71:    return iterator(new_node);
 72:
 73: }
 74:
 75: //
 76: // listmap::find(const key_type&)
 77: // cant use ==, must use less()
 78: //if not is less and not is greater
 79: template <typename key_t, typename mapped_t, class less_t>
 80: typename listmap<key_t,mapped_t,less_t>::iterator
 81: listmap<key_t,mapped_t,less_t>::find (const key_type& that) {
 82:    DEBUGF ('l', that);
 83:    auto itor = begin();
 84:    //for (auto itor = begin(); itor != end(); ++itor) {
 85:     while(itor !=end()){
 86:       if(!less(itor->first,that) && !less(that,itor->first)){
 87:          //return itor;
 88:          return iterator(itor);
 89:          break;
 90:       }
 91:       ++itor;
 92:    }
 93:    return end();
 94: }
 95:
 96: //
 97: // iterator listmap::erase (iterator position)
 98: //
 99: template <typename key_t, typename mapped_t, class less_t>
100: typename listmap<key_t,mapped_t,less_t>::iterator
101: listmap<key_t,mapped_t,less_t>::erase (iterator position) {
102:    DEBUGF ('l', &*position);
103:    //dont need to iterate because have .where
104:
105:    node *temp = position.where;
106:       iterator p = temp->prev;
107:       iterator n = temp->next;
108:    p.where->next = n.where;
109:    n.where->prev = p.where;
110:
111:    //delete temp->key;
112:    delete temp;
113:    return n;//should return temp->next's position
114:
115: }
116:
```

```
117:
```

```
 1: // $Id: xless.h,v 1.3 2014-04-24 18:02:55-07 - - $
 2:
 3: #ifndef __XLESS_H__
 4: #define __XLESS_H__
 5:
 6: //
 7: // We assume that the type type_t has an operator< function.
 8: //
 9:
10: template <typename Type>
11: struct xless {
12:    bool operator() (const Type& left, const Type& right) const {
13:       return left < right;
14:    }
15: };
16:
17: #endif
18:
```

```
 1: // $Id: xpair.h,v 1.5 2019-02-21 17:27:16-08 - - $
 2:
 3: #ifndef __XPAIR_H__
 4: #define __XPAIR_H__
 5:
 6: #include <iostream>
 7:
 8: using namespace std;
 9:
10: //
11: // Class xpair works like pair(c++).
12: //
13: // The implicitly generated members will work, because they just
14: // send messages to the first and second fields, respectively.
15: // Caution:  xpair() does not initialize its fields unless
16: // first_t and second_t do so with their default ctors.
17: //
18:
19: template <typename first_t, typename second_t>
20: struct xpair {
21:    first_t first{};
22:    second_t second{};
23:    xpair(){}
24:    xpair (const first_t& first_, const second_t& second_):
25:                  first(first_), second(second_) {}
26: };
27:
28: template <typename first_t, typename second_t>
29: ostream& operator<< (ostream& out,
30:                      const xpair<first_t,second_t>& pair) {
31:    out << "{" << pair.first << "," << pair.second << "}";
32:    return out;
33: }
34:
35: #endif
36:
```

```
 1: // $Id: debug.h,v 1.6 2021-05-22 02:29:26-07 - - $
 2: //Kai O'Brien (kimobrie@ucsc.edu)
 3:
 4: #ifndef __DEBUG_H__
 5: #define __DEBUG_H__
 6:
 7: #include <bitset>
 8: #include <climits>
 9: #include <string>
10: using namespace std;
11:
12: // debug -
13: //    static class for maintaining global debug flags.
14: // setflags -
15: //    Takes a string argument, and sets a flag for each char in the
16: //    string.  As a special case, '@', sets all flags.
17: // getflag -
18: //    Used by the DEBUGF macro to check to see if a flag has been set.
19: //    Not to be called by user code.
20:
21: class debugflags {
22:    private:
23:       using flagset = bitset<UCHAR_MAX + 1>;
24:       static flagset flags;
25:    public:
26:       static void setflags (const string& optflags);
27:       static bool getflag (char flag);
28:       static void where (char flag, const char* file, int line,
29:                          const char* pretty_function);
30: };
31:
```

```
32:
33: // DEBUGF -
34: //    Macro which expands into debug code.  First argument is a
35: //    debug flag char, second argument is output code that can
36: //    be sandwiched between <<.  Beware of operator precedence.
37: //    Example:
38: //       DEBUGF ('u', "foo = " << foo);
39: //    will print two words and a newline if flag 'u' is  on.
40: //    Traces are preceded by filename, line number, and function.
41:
42: #ifdef NDEBUG
43: #define DEBUGB(FLAG,CODE) ;
44: #define DEBUGF(FLAG,CODE) ;
45: #define DEBUGS(FLAG,STMT) ;
46: #else
47: #define DEBUGB(FLAG,CODE) { \
48:            if (debugflags::getflag (FLAG)) { \
49:               debugflags::where (FLAG, __FILE__, __LINE__, \
50:                                  __PRETTY_FUNCTION__); \
51:               cerr << CODE << endl; \
52:            } \
53:         }
54: #define DEBUGF(FLAG,CODE) { \
55:            if (debugflags::getflag (FLAG)) { \
56:               debugflags::where (FLAG, __FILE__, __LINE__, \
57:                                  __PRETTY_FUNCTION__); \
58:               cerr << CODE << endl; \
59:            } \
60:         }
61: #define DEBUGS(FLAG,STMT) { \
62:            if (debugflags::getflag (FLAG)) { \
63:               debugflags::where (FLAG, __FILE__, __LINE__, \
64:                                  __PRETTY_FUNCTION__); \
65:               STMT; \
66:            } \
67:         }
68: #endif
69:
70: #endif
71:
```

```
 1: // $Id: debug.cpp,v 1.4 2021-05-22 02:29:26-07 - - $
 2: //Kai O'Brien (kimobrie@ucsc.edu)
 3:
 4: #include <climits>
 5: #include <iostream>
 6: using namespace std;
 7:
 8: #include "debug.h"
 9: #include "util.h"
10:
11: debugflags::flagset debugflags::flags {};
12:
13: void debugflags::setflags (const string& initflags) {
14:    for (const unsigned char flag: initflags) {
15:       if (flag == '@') flags.set();
16:                   else flags.set (flag, true);
17:    }
18: }
19:
20: // getflag -
21: //    Check to see if a certain flag is on.
22:
23: bool debugflags::getflag (char flag) {
24:    // WARNING: Don't TRACE this function or the stack will blow up.
25:    return flags.test (static_cast<unsigned char> (flag));
26: }
27:
28: void debugflags::where (char flag, const char* file, int line,
29:                         const char* pretty_function) {
30:    cout << sys_info::execname() << ": DEBUG(" << flag << ") "
31:         << file << "[" << line << "] " << endl
32:         << "   " << pretty_function << endl;
33: }
34:
```

```
 1: // $Id: util.h,v 1.9 2021-04-28 12:12:32-07 - - $
 2:
 3: //
 4: // util -
 5: //    A utility class to provide various services not conveniently
 6: //    associated with other modules.
 7: //
 8:
 9: #ifndef __UTIL_H__
10: #define __UTIL_H__
11:
12: #include <iostream>
13: #include <stdexcept>
14: #include <string>
15: using namespace std;
16:
17: //
18: // sys_info -
19: //    Keep track of execname and exit status.  Must be initialized
20: //    as the first thing done inside main.  Main should call:
21: //       sys_info::set_execname (argv[0]);
22: //    before anything else.
23: //
24:
25: class sys_info {
26:    private:
27:       static string execname_;
28:       static int exit_status_;
29:       static void execname (const string& argv0);
30:       friend int main (int, char**);
31:    public:
32:       static const string& execname ();
33:       static void exit_status (int status);
34:       static int exit_status ();
35: };
36:
```

```
37:
38: //
39: // complain -
40: //    Used for starting error messages.  Sets the exit status to
41: //    EXIT_FAILURE, writes the program name to cerr, and then
42: //    returns the cerr ostream.  Example:
43: //       complain() << filename << ": some problem" << endl;
44: //
45:
46: ostream& complain();
47:
48: //
49: // syscall_error -
50: //    Complain about a failed system call.  Argument is the name
51: //    of the object causing trouble.  The extern errno must contain
52: //    the reason for the problem.
53: //
54:
55: void syscall_error (const string&);
56:
57: //
58: // string to_string (thing) -
59: //    Convert anything into a string if it has an ostream<< operator.
60: //
61:
62: template <typename item_t>
63: string to_string (const item_t&);
64:
65: //
66: // thing from_string (cons string&) -
67: //    Scan a string for something if it has an istream>> operator.
68: //
69:
70: template <typename item_t>
71: item_t from_string (const string&);
72:
73: //
74: // Put the RCS Id string in the object file.
75: //
76:
77: #include "util.tcc"
78: #endif
79:
```

```
 1: // $Id: util.tcc,v 1.4 2020-02-06 12:33:29-08 - - $
 2:
 3: #include <sstream>
 4: #include <typeinfo>
 5: using namespace std;
 6:
 7: template <typename Type>
 8: string to_string (const Type& that) {
 9:    ostringstream stream;
10:    stream << that;
11:    return stream.str();
12: }
13:
14: template <typename Type>
15: Type from_string (const string& that) {
16:    stringstream stream;
17:    stream << that;
18:    Type result;
19:    if (not (stream >> result and stream.eof())) {
20:       throw domain_error (string (typeid (Type).name())
21:             + " from_string (" + that + ")");
22:    }
23:    return result;
24: }
25:
```

```
 1: // $Id: util.cpp,v 1.18 2020-02-06 12:55:59-08 - - $
 2:
 3: #include <cassert>
 4: #include <cerrno>
 5: #include <cstdlib>
 6: #include <cstring>
 7: #include <ctime>
 8: #include <stdexcept>
 9: #include <string>
10: using namespace std;
11:
12: #include "debug.h"
13: #include "util.h"
14:
15: int sys_info::exit_status_ = EXIT_SUCCESS;
16: string sys_info::execname_; // Must be initialized from main().
17:
18: void sys_info::execname (const string& argv0) {
19:    assert (execname_ == "");
20:    int slashpos = argv0.find_last_of ('/') + 1;
21:    execname_ = argv0.substr (slashpos);
22:    cout << boolalpha;
23:    cerr << boolalpha;
24:    DEBUGF ('u', "execname_ = " << execname_);
25: }
26:
27: const string& sys_info::execname () {
28:    assert (execname_ != "");
29:    return execname_;
30: }
31:
32: void sys_info::exit_status (int status) {
33:    assert (execname_ != "");
34:    exit_status_ = status;
35: }
36:
37: int sys_info::exit_status () {
38:    assert (execname_ != "");
39:    return exit_status_;
40: }
41:
42: ostream& complain() {
43:    sys_info::exit_status (EXIT_FAILURE);
44:    cerr << sys_info::execname () << ": ";
45:    return cerr;
46: }
47:
48: void syscall_error (const string& object) {
49:    complain() << object << ": " << strerror (errno) << endl;
50: }
51:
```

```
 1: // $Id: main.cpp,v 1.17 2021-05-22 20:38:58-07 - - $
 2: //Kai O'Brien (kimobrie@ucsc.edu)
 3:
 4: #include <cstdlib>
 5: #include <exception>
 6: #include <iostream>
 7: #include <string>
 8: #include <unistd.h>
 9: //--------
10: #include <cassert>
11: #include <cerrno>
12: #include <fstream>
13: #include <iomanip>
14: #include <regex>
15: #include <stdexcept>
16: #include <typeinfo>
17:
18: using namespace std;
19:
20: #include "listmap.h"
21: #include "xpair.h"
22: #include "util.h"
23:
24: //m.insert(xpair{key,value})
25:
26: using str_str_map = listmap<string,string>;
27: using str_str_pair = str_str_map::value_type;
28: str_str_map test;//listmap
29:
30: void scan_options (int argc, char** argv) {
31:    opterr = 0;
32:    for (;;) {
33:       int option = getopt (argc, argv, "@:");
34:       if (option == EOF) break;
35:       switch (option) {
36:          case '@':
37:             debugflags::setflags (optarg);
38:             break;
39:          default:
40:             complain() << "-" << char (optopt) << ": invalid option"
41:                        << endl;
42:             break;
43:       }
44:    }
45: }
46:
47: void whitespace(string *line){
48:    //trim leading whitespace and returns position of =sign or -1
49:    unsigned long first = 0;//0 or 1?
50:    while(first<line->size() &&line->at(first) == ' '){
51:       line->erase(first,1);//at first position
52:       if(line->at(first)=='='){
53:
54:       }
55:       ++first;
56:    }
57:    int mid = 1;
58:    while(first<line->size()){
```

```
   59:       if(line->at(first)=='='){
   60:       }
   61:       if(line->at(first)=='\n'){
   62:          line->erase(first,mid);//at first position
   63:       }
   64:       else{
   65:          ++mid;
   66:       }
   67:       ++first;
   68:    }
   69:    //trims trailing whitespace
   70:     ssize_t last = line->size()-1;//0 or 1?
   71:    while(last>0 &&line->at(last) == ' '){
   72:       if(line->at(last)=='='){
   73:       }
   74:
   75:       line->erase(last,line->size()-1);//at first position
   76:       --last;
   77:    }
   78: }
   79:
   80: size_t eq_pos(string *line){
   81:    size_t eq = 1234;
   82:    size_t  first =  0;
   83:    while(first<line->size()){
   84:       if(line->at(first) == '='){
   85:          eq = first;
   86:          break;
   87:       }
   88:       ++first;
   89:    }
   90:
   91:    return eq;
   92: }
   93:
   94: //insert stuff to map when key = value not found
   95: //just do insert because already wrote code for that
   96: void catfile_helper (istream& infile, const string& filename) {
   97:    static string colons (32, ':');
   98:    cout << colons << endl << filename << endl << colons << endl;
   99:    regex comment_regex {R"(^\s*(#.*)?$)"};
  100:    regex key_value_regex {R"(^\s*(.*?)\s*=\s*(.*?)\s*$)"};
  101:    regex trimmed_regex {R"(^\s*([^=]+?)\s*$)"};
  102:    int i = 1;
  103:    for(;;) {
  104:       string line;
  105:       getline (infile, line);
  106:       whitespace(&line);//trim whitespace
  107:       //-----regex code
  108:  //      cout << "input: \"" << line << "\"" << endl;
  109:       if(line.length()>0){
  110:          smatch result;
  111:          if (regex_search (line, result, comment_regex)) {//prints twice
maybe idk
  112:             cout<<filename<<": "<<i<<": "<<line<<endl;
  113:             cout << "comment." << endl;
  114:          }
  115:          //key = value, if found, replace val, if not, insert
```

```
  116:          else if (regex_search (line, result, key_value_regex)) {
  117:             cout<<filename<<": "<<i<<": "<<line<<endl;
  118:             if(line.at(line.size()-1)=='='){
  119:                test.erase(test.find(result[1]));
  120:             }
  121:             else{
  122:             cout<< result[1]<< " = " <<result[2]<<endl;
  123:          // cout << "key  : \"" << result[1] << "\"" << endl;
  124:          //   cout << "value: \"" << result[2] << "\"" << endl;
  125:             test.insert(str_str_pair(result[1],result[2]));
  126:             }
  127:          }
  128:          //  key = , =, or =value
  129:          else if (regex_search (line, result, trimmed_regex)) {
  130:             cout<<filename<<": "<<i<<": "<<line<<endl;
  131:             cout<< result[1]<< endl;
  132:             //if its the key(can be more than 1 word key
  133:             //) and nothing else, print the value
  134:             size_t eq_pos1 = eq_pos(&line);
  135:             //if no eq sign
  136:             //key
  137:             if(eq_pos1==1234){
  138:                auto it = test.find(result[1]);
  139:                if(test.find(result[1])!=test.end()){
  140:                 cout<< it->first<< " = " <<it->second<<endl;
  141:
  142:                }
  143:                else{
  144:                   cout<< result[1]<< ": " <<"key not found"<<endl;
  145:                }
  146:             }
  147:
  148:            if(line.at(0)=='='){
  149:               //if the = is the only thing
  150:               if(line.size()==1){
  151:                   for (auto itor = test.begin(); itor != test.end(); ++i
tor) {
  152:                      cout<< itor->first<< " = " <<itor->second<<endl;
  153:                   }
  154:               }
  155:               else{  //result[2] or 1? iterate and match
  156:
  157:               }
  158:            }
  159:
  160:
  161:             //cout << "query: \"" << result[1] << "\"" << endl;
  162:          }else {
  163:             assert (false and "This can not happen.");
  164:          }
  165:          //-----
  166:
  167:       // cout << line << endl;
  168:          i++;
  169:       }
  170:       if (infile.eof()) break;
  171:    }
  172: }
```

```
173: // node* temp = new node(anchor(), anchor(), pair);
174:
175: int main (int argc, char** argv) {
176:    sys_info::execname (argv[0]);
177:    scan_options (argc, argv);
178: //-----------------------matchlines
179: const string cin_name = "-";
180: int status = 0;
181:    string progname ( (argv[0]));
182:    vector<string> filenames (&argv[1], &argv[argc]);
183:    if (filenames.size() == 0) filenames.push_back (cin_name);
184:    for (const auto& filename: filenames) {
185:       if (filename == cin_name) catfile_helper (cin, filename);
186:       else {
187:          ifstream infile (filename);
188:          if (infile.fail()) {
189:             status = 1;
190:             cerr << progname << ": " << filename << ": "
191:                  << strerror (errno) << endl;
192:          }else {
193:             catfile_helper (infile, filename);
194:             infile.close();
195:          }
196:       }
197:    }
198:    return status;
199:   // cout << "EXIT_SUCCESS" << endl;
200:   // return EXIT_SUCCESS;
201: }
202:
```

```
 1: # $Id: Makefile,v 1.27 2021-05-22 02:29:26-07 - - $
 2: #Kai O'Brien (kimobrie@ucsc.edu)
 3:
 4: MKFILE      = Makefile
 5: DEPFILE     = ${MKFILE}.dep
 6: NOINCL      = ci clean spotless check lint
 7: NEEDINCL    = ${filter ${NOINCL}, ${MAKECMDGOALS}}
 8: GMAKE       = ${MAKE} --no-print-directory
 9:
10: GPPWARN     = -Wall -Wextra -Wpedantic -Wshadow -Wold-style-cast
11: GPPOPTS     = ${GPPWARN} -fdiagnostics-color=never
12: COMPILECPP  = g++ -std=gnu++17 -g -O0 ${GPPOPTS}
13: MAKEDEPCPP  = g++ -std=gnu++17 -MM ${GPPOPTS}
14: UTILBIN     = /afs/cats.ucsc.edu/courses/cse111-wm/bin
15:
16: MODULES     = listmap xless xpair debug util main
17: CPPSOURCE   = ${wildcard ${MODULES:=.cpp}}
18: OBJECTS     = ${CPPSOURCE:.cpp=.o}
19: SOURCELIST  = ${foreach MOD, ${MODULES}, ${MOD}.h ${MOD}.tcc ${MOD}.cpp}
20: ALLSOURCE   = ${wildcard ${SOURCELIST}}
21: EXECBIN     = keyvalue
22: OTHERS      = ${MKFILE} ${DEPFILE}
23: ALLSOURCES  = ${ALLSOURCE} ${OTHERS}
24: LISTING     = Listing.ps
25:
26: all : ${EXECBIN}
27:
28: ${EXECBIN} : ${OBJECTS}
29:         ${COMPILECPP} -o $@ ${OBJECTS}
30:
31: %.o : %.cpp
32:         ${COMPILECPP} -c $<
33:
34: lint : ${CPPSOURCE}
35:         ${UTILBIN}/cpplint.py.perl ${CPPSOURCE}
36:
37: check : ${ALLSOURCES}
38:         ${UTILBIN}/checksource ${ALLSOURCES}
39:
40: ci : ${ALLSOURCES}
41:         ${UTILBIN}/cid -is ${ALLSOURCES}
42:
43: lis : ${ALLSOURCES}
44:         mkpspdf ${LISTING} ${ALLSOURCES}
45:
46: clean :
47:         - rm ${OBJECTS} ${DEPFILE} core
48:
49: spotless : clean
50:         - rm ${EXECBIN} ${LISTING} ${LISTING:.ps=.pdf}
51:
52: dep : ${ALLCPPSRC}
53:         @ echo "# ${DEPFILE} created `LC_TIME=C date`" >${DEPFILE}
54:         ${MAKEDEPCPP} ${CPPSOURCE} >>${DEPFILE}
55:
56: ${DEPFILE} :
57:         @ touch ${DEPFILE}
58:         ${GMAKE} dep
```

```
59:
60: again :
61:         ${GMAKE} spotless dep ci all lis
62: submit:
63:         submit cse111-wm.s21 ko3 *.cpp *.tcc *.h Makefile README
64:
65: ifeq (${NEEDINCL}, )
66: include ${DEPFILE}
67: endif
68:
```

```
1: # Makefile.dep created Sat May 22 20:46:04 PDT 2021
2: debug.o: debug.cpp debug.h util.h util.tcc
3: util.o: util.cpp debug.h util.h util.tcc
4: main.o: main.cpp listmap.h debug.h xless.h xpair.h listmap.tcc util.h \
5:  util.tcc
```