1. Copyright.

2. *prt_xrefs_docs.lex* **Grammar.**
Various cross references:
1) used vocabulary symbols referenced against each rule's subrule and position
2) first set per rule
3) productions derived lr states
4) list of reducing lr states
5) Per state Follow set calculations
6) Commonized follow sets for reducing subrules

3. Fsm Cprt_xrefs_docs class.

4. Cprt_xrefs_docs op directive.

⟨ Cprt_xrefs_docs op directive 4 ⟩ ≡
```
prt_sr_elems_filter_.insert(T_Enum::T_T_subrule_def_);
prt_sr_elems_filter_.insert(T_Enum::T_refered_T_);
prt_sr_elems_filter_.insert(T_Enum::T_T_eosubrule_);
prt_sr_elems_filter_.insert(T_Enum::T_refered_rule_);
prt_sr_elems_filter_.insert(T_Enum::T_T_called_thread_eosubrule_);
prt_sr_elems_filter_.insert(T_Enum::T_T_null_call_thread_eosubrule_);
no_subrules_per_rule_.push_back(0);
time_t theTime = time(0);
char *cTime = ctime(&theTime);
gened_date_time_ += string(cTime);
int n = gened_date_time_.find('\n');
gened_date_time_[n] = ' ';
rule_def_ = 0;
subrule_def_ = 0;
rule_no_ = 0;
subrule_no_ = 0;
elem_no_ = 0;
no_of_rules_ = 0;
no_of_subrules_ = 0;
w_index_filename_ += grammar_filename_prefix_.c_str();
w_index_filename_ += "_idx.w";
ow_index_file_.open(w_index_filename_.c_str(), ios_base::out | ios::trunc);
if (¬ow_index_file_) {
  CAbs_lr1_sym * sym = new Err_bad_filename(w_index_filename_.c_str());
  sym→set_who_created(__FILE__, __LINE__);
  parser__→add_token_to_error_queue(*sym);
  parser__→set_stop_parse(true);
  return;
}
```

5. Cprt_xrefs_docs user-declaration directive.

⟨ Cprt_xrefs_docs user-declaration directive 5 ⟩ ≡

```
public: char big_buf_[BIG_BUFFER_32K]; set < int > prt_sr_elems_filter_;
        std::map < int , std::string > xlated_names_; std::map < int ,
        std::list < state_element *>> productions_derived_states_list_;
  std::vector < state *> reducing_states_list_; std::vector < int > no_subrules_per_rule_;
  std::string gened_date_time_;
  std::string w_index_filename_;
  std::ofstream ow_index_file_;
  std::string grammar_filename_prefix_;
  std::string fq_filename_noext_;
  int rule_no_;
  int subrule_no_;
  int elem_no_;
  int no_of_rules_;
  int no_of_subrules_;
  std::string rule_name_;
  std::string elem_name_;
  rule_def * rule_def_;
  T_subrule_def * subrule_def_;
  std::list < NS_yacco2_terminals::rule_def *> rules_for_fs_prt_;
  std::map < std::string, std::list < std::string >> xref_of_used_symbols_;
  void add_symbol_to_xref_map(std::string & Key, std::string & Ref);
  void determine_closure_derived_states( );
  void prt_states_follow_set( );
  void prt_follow_set_local_yield(follow_element * Fe);
  void prt_follow_set_creators(follow_element * Fe);
  void prt_follow_set_transitions(follow_element * Fe);
  void prt_follow_set_merges(follow_element * Fe);
  void prt_state_s_follow_set_rules(state * Cur_state);
  void prt_common_follow_set_la( );
```

6. Cprt_xrefs_docs user-implementation directive.

⟨ Cprt_xrefs_docs user-implementation directive 6 ⟩ ≡

```
void Cprt_xrefs_docs::determine_closure_derived_states(){ std::map < int
    , std::list < state_element *>> ::iterator xi; std::map < int ,
    std::list < state_element *>> ::iterator xie;
  STATES_ITER_type si = LR1_STATES.begin();
  STATES_ITER_type sie = LR1_STATES.end();
  int integerize_the_subrule(0);
  for ( ; si ≠ sie; ++si) {      /* read states */
    state * cur_state = *si;
    using namespace NS_yacco2_T_enum;
    S_VECTORS_ITER_type svi = cur_state→state_s_vector_.begin();
    S_VECTORS_ITER_type svie = cur_state→state_s_vector_.end();
    S_VECTORS_ITER_type tvi = cur_state→state_s_vector_.find(-T_Enum::T_T_eosubrule_);
    if (tvi ≠ svie) {
      reducing_states_list_.push_back(cur_state);
      goto rd_vector_s_elems;
    }
    tvi = cur_state→state_s_vector_.find(-T_Enum::T_T_called_thread_eosubrule_);
    if (tvi ≠ svie) {
      reducing_states_list_.push_back(cur_state);
      goto rd_vector_s_elems;
    }
    tvi = cur_state→state_s_vector_.find(-T_Enum::T_T_null_call_thread_eosubrule_);
    if (tvi ≠ svie) {
      reducing_states_list_.push_back(cur_state);
      goto rd_vector_s_elems;
    }
  rd_vector_s_elems: ;
    for ( ; svi ≠ svie; ++svi) {      /* rd the same vector's elements */
      S_VECTOR_ELEMS_ITER_type seli = svi→second.begin();
      S_VECTOR_ELEMS_ITER_type selie = svi→second.end();
      for ( ; seli ≠ selie; ++seli) {
        state_element * se = *seli;
        if (se→previous_state_ ≠ 0) continue;
        integerize_the_subrule = se→subrule_def_→its_grammar_s_pos();
        xi = productions_derived_states_list_.find(integerize_the_subrule);
        if (xi ≡ productions_derived_states_list_.end()) {
          productions_derived_states_list_[integerize_the_subrule] = std::list < state_element *> ();
        }
        xi = productions_derived_states_list_.find(integerize_the_subrule);
        xi→second.push_back(se);
      }
    }
  }
  }
```

7. *add_symbol_to_xref_map*.

```
⟨ More code 7 ⟩ ≡
  void Cprt_xrefs_docs::add_symbol_to_xref_map(std::string & Key, std::string & Ref)
  {
    std::map < std::string, std::list < std::string >> ::iterator i;
    i = xref_of_used_symbols_.find(Key.c_str());
    if (i ≡ xref_of_used_symbols_.end()) {
      xref_of_used_symbols_[Key.c_str()] = std::list < std::string > ();
      i = xref_of_used_symbols_.find(Key);
      std::list < std::string > &xxx = i→second;
      xxx.push_back(string(Ref.c_str()));
      return;
    }
    else {
      std::list < std::string > &xxx = i→second;
      xxx.push_back(string(Ref.c_str()));
    }
  }
```

See also sections 8, 9, 10, 11, 12, 13, and 14.

8. *prt_follow_set_local_yield*.

```
⟨ More code 7 ⟩ +≡
  void Cprt_xrefs_docs::prt_follow_set_local_yield(follow_element * Fe)
  {
    KCHARP w_follset_local_yield = "\\FollSetreducinglocalyield␣%s";
    sprintf(big_buf_, w_follset_local_yield, "␣");
    ow_index_file_ ≪ big_buf_ ≪ endl;
    KCHARP w_follset_t = "%s";
    char t_name[Max_cweb_item_size];
    FOLLOW_SETS_ITER_type fsi = Fe→follow_set_.begin();
    FOLLOW_SETS_ITER_type fsie = Fe→follow_set_.end();
    for ( ; fsi ≠ fsie; ) {      /* those Tes */
      T_in_stbl * t = *fsi;
      t_name[0] = (char) 0;
      XLATE_SYMBOLS_FOR_cweave(t→t_def()→t_name()→c_str(), t_name);
      sprintf(big_buf_, w_follset_t, t_name);
      ow_index_file_ ≪ big_buf_;
      ++fsi;
      if (fsi ≠ fsie) {
        ow_index_file_ ≪ "," ≪ endl;
      }
      else {
        ow_index_file_ ≪ "." ≪ endl;
      }
    }
    ow_index_file_ ≪ endl;      /* end it with blank line */
  }
```

9. *prt_follow_set_creators*.

```
⟨ More code 7 ⟩ +≡
  void Cprt_xrefs_docs::prt_follow_set_creators(follow_element * Fe){ char rule_name[Max_cweb_item_size];
      KCHARP w_follset_start_str = "\\halign{\n""\\span\\FollSettemplate\n""\\FollSettitle";
      KCHARP w_follset_stateno_rule = "{%s\\rulenameno{%i}}&\n"      /* rule+rule no */
      "{";      /* start of the contributors */
      KCHARP w_follset_creators = "\\FollSetcreators{%i}{%i}{%i}";
      sprintf(big_buf_, w_follset_start_str, "");
      ow_index_file_ ≪ big_buf_ ≪ endl; rule_def * rd = ( rule_def * ) AST::content(*Fe→rule_def_t_);
      rule_name[0] = (char) 0;
      XLATE_SYMBOLS_FOR_cweave(rd→rule_name()→c_str(), rule_name);
      sprintf(big_buf_, w_follset_stateno_rule, rule_name, rd→rule_no());
      ow_index_file_ ≪ big_buf_ ≪ endl;
      SR_ELEMENTS_type::iterator sri = Fe→sr_elements_.begin();
      SR_ELEMENTS_type::iterator srie = Fe→sr_elements_.end(); for ( ; sri ≠ srie; ++sri) {
        /* follow set contributors */
      AST * et = *sri;      /* eos */
      AST * pvrt = et→pr_; refered_rule * rr = ( refered_rule * ) AST::content(*pvrt);
      T_subrule_def * srd = rr→its_subrule_def();
      rule_def * sr_d = srd→its_rule_def();
      sprintf(big_buf_, w_follset_creators, sr_d→rule_no(), srd→subrule_no_of_rule(), rr→element_pos());
      ow_index_file_ ≪ big_buf_ ≪ endl; } }
```

10. *prt_follow_set_merges*.

```
⟨ More code 7 ⟩ +≡
  void Cprt_xrefs_docs::prt_follow_set_merges(follow_element * Fe)
  {
    KCHARP w_overflow_close_and_new_blank_rule = "}\\cr\n""{}&\n"      /* blank sule name */
    "{%s";      /* start of new meging list */
    KCHARP w_follset_merges = "\\FollSetmerges{%i}";      /* state where other follow set rule lies */
    MERGES_ITER_type mi = Fe→merges_.begin();
    MERGES_ITER_type mie = Fe→merges_.end();
    int overflow_limit(10);
    int merge_cnt(0);
    for ( ; mi ≠ mie; ++mi) {      /* transitions */
      state * s = *mi;
      ++merge_cnt;
      if (merge_cnt > overflow_limit) {
        sprintf(big_buf_, w_overflow_close_and_new_blank_rule, "␣");
        ow_index_file_ ≪ big_buf_ ≪ endl;
        merge_cnt = 1;
      }
      sprintf(big_buf_, w_follset_merges, s→state_no_);
      ow_index_file_ ≪ big_buf_ ≪ endl;
    }
  }
```

11. *prt_follow_set_transitions*.

```
⟨ More code 7 ⟩ +≡
  void Cprt_xrefs_docs::prt_follow_set_transitions(follow_element * Fe){
      KCHARP w_follset_transitions = "\\FollSettransition{%i}{%i}";    /* rt bnded */
    TRANSITIONS_ITER_type ti = Fe→transitions_.begin();
    TRANSITIONS_ITER_type tie = Fe→transitions_.end(); for ( ; ti ≠ tie; ++ti) {
      /* transitions */
    follow_element * tfe = *ti; rule_def * rd = ( rule_def * ) AST::content(*tfe→rule_def_t_);
    sprintf(big_buf_, w_follset_transitions, tfe→its_state_→state_no_, rd→rule_no());
    ow_index_file_ ≪ big_buf_ ≪ endl; } KCHARP w_follset_end_str = "}%s\\cr";
    sprintf(big_buf_, w_follset_end_str, "␣");
    ow_index_file_ ≪ big_buf_ ≪ endl;
    KCHARP w_follset_end_rule = "}%s";
    sprintf(big_buf_, w_follset_end_rule, "␣");
    ow_index_file_ ≪ big_buf_ ≪ endl; }
```

12. *prt_state_s_follow_set_rules*.

```
⟨ More code 7 ⟩ +≡
  void Cprt_xrefs_docs::prt_state_s_follow_set_rules(state * Cur_state)
  {
    KCHARP w_follset_stateno =      /* stateno */
    "\\FollSetstateno{%i}";
    S_FOLLOW_SETS_ITER_type fsi = Cur_state→state_s_follow_set_map_.begin();
    S_FOLLOW_SETS_ITER_type fsie = Cur_state→state_s_follow_set_map_.end();
    if (fsi ≡ fsie) return;     /* nada follow set info in this state */
    sprintf(big_buf_, w_follset_stateno, Cur_state→state_no_);
    ow_index_file_ ≪ big_buf_ ≪ endl;
    for ( ; fsi ≠ fsie; ++fsi) {     /* state's follow set info */
      follow_element * fe = (*fsi).second;
      prt_follow_set_creators(fe);
      prt_follow_set_merges(fe);
      prt_follow_set_transitions(fe);
      prt_follow_set_local_yield(fe);
    }
  }
```

13. *prt_states_follow_set*.

```
⟨ More code 7 ⟩ +≡
  void Cprt_xrefs_docs::prt_states_follow_set()
  {
    KCHARP w_states_follow_sets = "@**␣Lr1␣State's␣Follow␣sets␣and␣reducing␣lookahead␣sets.\\f\
        break\n""\\FollSetnotesintro\n""\\fbreak";
    ow_index_file_ ≪ w_states_follow_sets ≪ std::endl;
    STATES_ITER_type si = LR1_STATES.begin();
    STATES_ITER_type sie = LR1_STATES.end();
    for ( ; si ≠ sie; ++si) {     /* walk the states */
      state * cur_state = *si;
      prt_state_s_follow_set_rules(cur_state);
    }
  }
```

14. *prt_common_follow_set_la*.

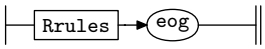
```
⟨ More code 7 ⟩ +≡
  void Cprt_xrefs_docs::prt_common_follow_set_la( )
  {
    KCHARP w_common_follow_sets = "@*1␣Common␣Follow␣sets.\\fbreak\n";
    ow_index_file_ ≪ w_common_follow_sets ≪ std::endl;
    KCHARP w_common_follow_set = "@*2␣LA␣set:␣%i.\\fbreak\n""\\item{}\n""\\raggedright";
    KCHARP la_set_entry_literal = "%s";
    char t_name[Max_cweb_item_size];
    COMMON_LA_SETS_ITER_type i = COMMON_LA_SETS.begin( );
    COMMON_LA_SETS_ITER_type ie = COMMON_LA_SETS.end( );
    for (int idx = 0; i ≠ ie; ++i, ++idx) {
      LA_SET_type * la_set = *i;
      sprintf(big_buf_, w_common_follow_set, idx + 1);
      ow_index_file_ ≪ big_buf_ ≪ endl;
      LA_SET_ITER_type j = la_set→begin( );      /* list out the T literals */
      LA_SET_ITER_type je = la_set→end( );
      for ( ; j ≠ je; ) {
        T_in_stbl * tsym = *j;
        t_name[0] = (char) 0;
        XLATE_SYMBOLS_FOR_cweave(tsym→t_def( )→t_name( )→c_str( ), t_name);
        sprintf(big_buf_, la_set_entry_literal, t_name);
        ow_index_file_ ≪ big_buf_;
        ++j;
        if (j ≠ je) {
          ow_index_file_ ≪ "," ≪ endl;
        }
        else {
          ow_index_file_ ≪ "." ≪ endl;
        }
      }
      ow_index_file_ ≪ endl;      /* close off the items */
    }
  }
```

15. Cprt_xrefs_docs user-prefix-declaration directive.

```
⟨ Cprt_xrefs_docs user-prefix-declaration directive 15 ⟩ ≡
#include "time.h"
#include "o2_externs.h"
#include "prt_sr_elements.h"
  extern void PRT_RULE_S_FIRST_SET(std::ofstream & Ofile, NS_yacco2_terminals::rule_def * Rule_def);
  extern void XLATE_SYMBOLS_FOR_cweave(const char *Sym_to_xlate, char *Xlated_sym);
  extern int MPOST_CWEB_xlated_symbol(AST * Sym, char *Xlated_sym);
  extern STATES_type LR1_STATES;
  extern COMMON_LA_SETS_type COMMON_LA_SETS;
```

16. *Rprt_xrefs_docs* **rule.**

```
Rprt_xrefs_docs
```



⟨ Rprt_xrefs_docs subrule 1 op directive 16 ⟩ ≡

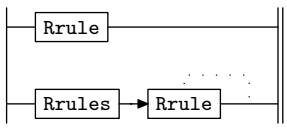
```
Cprt_xrefs_docs * fsm = ( Cprt_xrefs_docs * ) rule_info__.parser__->fsm_tbl__;
int rule_no = 1;
KCHARP w_doc_index = "\\input␣\"supp-pdf\"\n""\\input␣\"/usr/local/yacco2/diagrams+et\
    c/o2mac.tex\"\n""\\IDXdoctitle{%s}{%s}";
char xlate_file[Max_cweb_item_size];
XLATE_SYMBOLS_FOR_cweave(fsm->w_index_filename_.c_str( ), xlate_file);
sprintf (fsm->big_buf_, w_doc_index, xlate_file, xlate_file);
fsm->ow_index_file_ << fsm->big_buf_ << std::endl;
KCHARP w_used_xref_index = "@**␣Grammar␣symbols:␣Used␣cross␣referen\
    ce.\\fbreak\n""Reference␣of␣each␣grammar's␣symbol␣used␣within␣each␣rule's␣\
    productions.␣The␣index\n""uses␣the␣tripple:␣rule␣name,␣its␣subrul\
    e␣no,␣and␣the␣symbol's␣position\n""␣within␣the␣symbol␣string.";
fsm->ow_index_file_ << w_used_xref_index << std::endl;
char key[Max_cweb_item_size];
char xlate_key_sym[Max_cweb_item_size];
char xref_key[Max_cweb_item_size];
char xlate_sym[Max_cweb_item_size];
char xlated_rule[Max_cweb_item_size];
std::map < std::string, std::list < std::string >> ::iterator i = fsm->xref_of_used_symbols_.begin( );
std::map < std::string, std::list < std::string >> ::iterator ie = fsm->xref_of_used_symbols_.end( );
for ( ; i ≠ ie; ++i) {
  strcpy(key, i->first.c_str( ));
  XLATE_SYMBOLS_FOR_cweave((const char *) key, xlate_key_sym);
  fsm->ow_index_file_ << "@*2␣" << xlate_key_sym << ":.\\fbreak" << endl;
  std::list < std::string > &xxx = i->second;
  std::list < std::string > ::iterator k = xxx.begin( );
  std::list < std::string > ::iterator ke = xxx.end( );
  for ( ; k ≠ ke; ++k) {
    strcpy(xref_key, k->c_str( ));
    XLATE_SYMBOLS_FOR_cweave((const char *) xref_key, xlate_sym);
    fsm->ow_index_file_ << xlate_sym << "\\␣\\␣" << endl;
  }
  fsm->ow_index_file_ << "\\fbreak" << endl;
}
KCHARP w_fs_index = "@**␣Grammar␣Rules's␣First␣Sets.\\fbreak\n";
fsm->ow_index_file_ << w_fs_index << std::endl;
std::list < rule_def *> ::iterator j = fsm->rules_for_fs_prt_.begin( );
std::list < rule_def *> ::iterator je = fsm->rules_for_fs_prt_.end( );
for ( ; j ≠ je; ++j) {
  PRT_RULE_S_FIRST_SET(fsm->ow_index_file_, *j);
}
;
KCHARP w_lr_state_network = "@*2␣LR␣State␣Network.\\fbreak\n""\\LRstatenetwork\n";
KCHARP w_xref_rule_rank_to_literal = "@.R$_{%i}$␣---␣%s@>\n";
fsm->ow_index_file_ << w_lr_state_network << std::endl;
```

```
fsm→determine_closure_derived_states( ); std::map < int , std::list < state_element *>> ::iterator xi;
    std::map < int , std::list < state_element *>> ::iterator xie;
xi = fsm→productions_derived_states_list_.begin( );
xie = fsm→productions_derived_states_list_.end( );
rule_def * ord(0);
rule_def * rd(0); for ( ; xi ≠ xie; ++xi) {      /* walk all the derived productions list */
std::list < state_element *> &selist = xi→second;
std::list < state_element *> ::iterator f1st_el = selist.begin( ); state_element * se = ( state_element * )
    *f1st_el;
T_subrule_def * srd = se→subrule_def_;
rd = srd→its_rule_def( );
if (ord ≠ rd) {
  ord = rd;
  XLATE_SYMBOLS_FOR_cweave(ord→rule_name( )→c_str( ), xlated_rule);
  KCHARP w_rule_name = "@*3␣%s.\\fbreak";
  sprintf(fsm→big_buf_, w_rule_name, xlated_rule);
  fsm→ow_index_file_ << fsm→big_buf_ << std::endl;
  sprintf(fsm→big_buf_, w_xref_rule_rank_to_literal, rd→rule_no( ), xlated_rule);
  fsm→ow_index_file_ << fsm→big_buf_ << std::endl;
}
KCHARP w_subrule = "\\Subrulestartsymstrindent{%i}␣";
sprintf(fsm→big_buf_, w_subrule, srd→subrule_no_of_rule( ));
fsm→ow_index_file_ << fsm→big_buf_;      /* print its rhs elements */
AST * sr_t = srd→subrule_s_tree( );
tok_can_ast_functor sr_elems_walk_functr;
ast_prefix_1forest prt_sr_elems_walk(*sr_t, &sr_elems_walk_functr, &fsm→prt_sr_elems_filter_,
    ACCEPT_FILTER);
tok_can < AST *> prt_sr_elems_can(prt_sr_elems_walk);
using namespace NS_prt_sr_elements;
Cprt_sr_elements prt_sr_elements_fsm;
prt_sr_elements_fsm.ow_index_file_ = &fsm→ow_index_file_;
Parser prt_sr_elements(prt_sr_elements_fsm, &prt_sr_elems_can, 0);
prt_sr_elements.parse( );
list < state_element *> &dlist = xi→second;
list < state_element *> ::iterator yi = dlist.begin( );
list < state_element *> ::iterator yie = dlist.end( );
KCHARP w_subrule_derived_states = "\\Subruledervedstatesindent␣";
KCHARP w_merged = "{\\Mergedstate{%i}}"; std::set < int > chk_merge;
chk_merge.clear( ); for ( ; yi ≠ yie; ++yi) {      /* derive state list per closured production */
fsm→ow_index_file_ << w_subrule_derived_states << endl;
state_element * se = *yi;
state_element * dse = se; for ( ; dse ≠ 0; dse = dse→next_state_element_) {
  /* walk the derived plank */
fsm→ow_index_file_ << dse→self_state_→state_no_; if (dse→next_state_element_ ≠ 0) { std::set <
    int > ::iterator si = chk_merge.find(dse→next_state_element_→self_state_→state_no_);
if (si ≠ chk_merge.end( )) {
  sprintf(fsm→big_buf_, w_merged, dse→goto_state_→state_no_);
  fsm→ow_index_file_ << fsm→big_buf_ << endl;
  break;
}
} chk_merge.insert(dse→self_state_→state_no_);
```

```
fsm→ow_index_file_ ≪ "\\␣\\␣" ≪ endl; } } } KCHARP w_list_of_reduced_states =
    "@*2␣List␣of␣reducing␣states.\\fbreak\n""\\Listofreducingstates\n""\\fbreak\n";
fsm→ow_index_file_ ≪ w_list_of_reduced_states ≪ std::endl;
fsm→ow_index_file_ ≪ "\\Reducedstatelist" ≪ std::endl;
std::vector < state *> ::iterator ri = fsm→reducing_states_list_.begin( );
std::vector < state *> ::iterator rie = fsm→reducing_states_list_.end( );
for ( ; ri ≠ rie; ++ri) {
  state * s = *ri;
  fsm→ow_index_file_ ≪ '{' ≪ s→state_no_;
  switch (s→state_type_) {
  case 0:
    {    /*shift only */
      break;
    }
  case 1:
    {
      fsm→ow_index_file_ ≪ "\\Reduceonly";
      break;
    }
  case 2:
    {
      fsm→ow_index_file_ ≪ "\\ShiftReduce";
      break;
    }
  case 3:
    {
      fsm→ow_index_file_ ≪ "\\MultipleReduces";
      break;
    }
  case 4:
    {
      fsm→ow_index_file_ ≪ "\\ShiftandMultipleReduces";
      break;
    }
  }
  fsm→ow_index_file_ ≪ "\\␣\\␣}" ≪ std::endl;
}
fsm→prt_states_follow_set( );
fsm→prt_common_follow_set_la( );
fsm→ow_index_file_ ≪ "@**␣Index." ≪ endl;
fsm→ow_index_file_.close( );
```

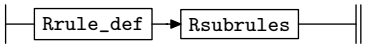
17. *Rrules* **rule.**

```
Rrules
```



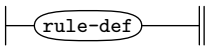
18. *Rrule* **rule.**

```
Rrule
```



19. *Rrule_def* **rule.**

```
Rrule_def
```

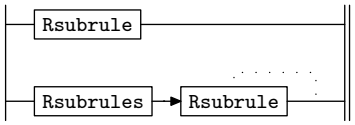


⟨ Rrule_def subrule 1 op directive 19 ⟩ ≡

```
Cprt_xrefs_docs * fsm = ( Cprt_xrefs_docs * ) rule_info__.parser__->fsm_tbl__;
fsm->rule_def_ = sf->p1__;
fsm->rules_for_fs_prt_.push_back(fsm->rule_def_);
++fsm->rule_no_;
fsm->subrule_no_ = 0;
```

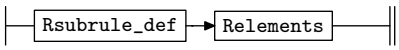
20. *Rsubrules* **rule.**

```
Rsubrules
```



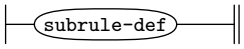
21. *Rsubrule* **rule.**

```
Rsubrule
```



22. *Rsubrule_def* **rule.**

```
Rsubrule_def
```

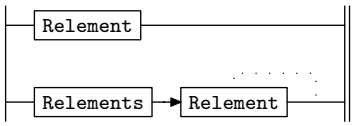


⟨ Rsubrule_def subrule 1 op directive 22 ⟩ ≡

```
Cprt_xrefs_docs * fsm = ( Cprt_xrefs_docs * ) rule_info__.parser__->fsm_tbl__;
++fsm->subrule_no_;
fsm->elem_no_ = 0;
fsm->subrule_def_ = sf->p1__;
```

23. *Relements* **rule.**

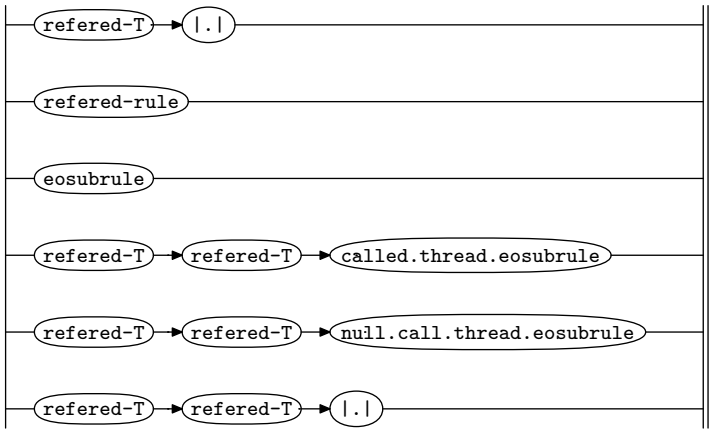
```
Relements
```



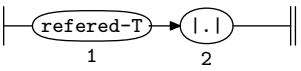
24. *Relement* **rule.**

Use of `|.|` to make grammar lr(1).

`Relement`



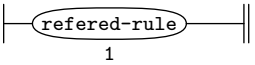
25. *Relement*'**s subrule 1.**



⟨ Relement subrule 1 op directive 25 ⟩ ≡

```
Cprt_xrefs_docs * fsm = ( Cprt_xrefs_docs * ) rule_info__.parser__->fsm_tbl__;
++fsm->elem_no_;
string xref_entry;
const char *xref_pattern = "%s %i.%i";
sprintf(fsm->big_buf_, xref_pattern, fsm->rule_def_->rule_name()->c_str(), fsm->subrule_no_, fsm->elem_no_);
xref_entry += fsm->big_buf_;
string xref_key(sf->p1__->its_t_def()->t_name()->c_str());
fsm->add_symbol_to_xref_map(xref_key, xref_entry);
```

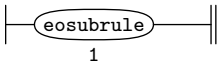
26. *Relement*'**s subrule 2.**



⟨ Relement subrule 2 op directive 26 ⟩ ≡

```
Cprt_xrefs_docs * fsm = ( Cprt_xrefs_docs * ) rule_info__.parser__->fsm_tbl__;
++fsm->elem_no_;
string xref_entry;
const char *xref_pattern = "%s %i.%i";
sprintf(fsm->big_buf_, xref_pattern, fsm->rule_def_->rule_name()->c_str(), fsm->subrule_no_, fsm->elem_no_);
xref_entry += fsm->big_buf_;
string xref_key(sf->p1__->its_rule_def()->rule_name()->c_str());
fsm->add_symbol_to_xref_map(xref_key, xref_entry);
```

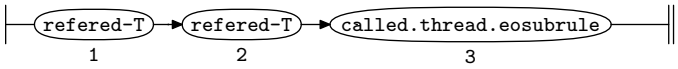
27. *Relement*'s subrule 3.



⟨ Relement subrule 3 op directive 27 ⟩ ≡

```
Cprt_xrefs_docs * fsm = ( Cprt_xrefs_docs * ) rule_info__.parser__->fsm_tbl__;
++fsm->elem_no_;
if (fsm->elem_no_ == 1) {      /* epsilon */
  string xref_entry;
  const char *xref_pattern = "%s %i.%i";
  sprintf(fsm->big_buf_, xref_pattern, fsm->rule_def_->rule_name()->c_str(), fsm->subrule_no_, fsm->elem_no_);
  xref_entry += fsm->big_buf_;
  string xref_key("\\emptyrule");
  fsm->add_symbol_to_xref_map(xref_key, xref_entry);
}
```

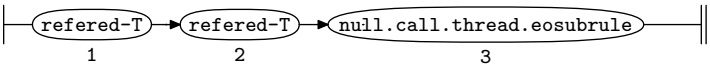
28. *Relement*'s subrule 4.



⟨ Relement subrule 4 op directive 28 ⟩ ≡

```
Cprt_xrefs_docs * fsm = ( Cprt_xrefs_docs * ) rule_info__.parser__->fsm_tbl__;
++fsm->elem_no_;
string xref_entry;
const char *xref_pattern = "%s %i.%i";
sprintf(fsm->big_buf_, xref_pattern, fsm->rule_def_->rule_name()->c_str(), fsm->subrule_no_, fsm->elem_no_);
xref_entry += fsm->big_buf_;
string xref_key;
if (sf->p1__->its_t_def()->enum_id() == T_Enum::T_LR1_parallel_operator_) {
  xref_key += "|||";
}
else {
  xref_key += "|t|";
}
fsm->add_symbol_to_xref_map(xref_key, xref_entry);
++fsm->elem_no_;
string xref_rtned_entry;
sprintf(fsm->big_buf_, xref_pattern, fsm->rule_def_->rule_name()->c_str(), fsm->subrule_no_, fsm->elem_no_);
xref_rtned_entry += fsm->big_buf_;
string xref_rtned_key(sf->p2__->its_t_def()->t_name()->c_str());
fsm->add_symbol_to_xref_map(xref_rtned_key, xref_rtned_entry);
++fsm->elem_no_;
string xref_thd_entry;
sprintf(fsm->big_buf_, xref_pattern, fsm->rule_def_->rule_name()->c_str(), fsm->subrule_no_, fsm->elem_no_);
xref_thd_entry += fsm->big_buf_;
string xref_thd_key;
xref_thd_key += sf->p3__->ns()->identifier()->c_str();
xref_thd_key += "::";
xref_thd_key += sf->p3__->called_thread_name()->identifier()->c_str();
fsm->add_symbol_to_xref_map(xref_thd_key, xref_thd_entry);
```

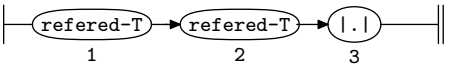
29. *Relement*'s subrule 5.



⟨ Relement subrule 5 op directive 29 ⟩ ≡

```
Cprt_xrefs_docs * fsm = ( Cprt_xrefs_docs * ) rule_info__.parser__->fsm_tbl__;
++fsm->elem_no_;
string xref_entry;
const char *xref_pattern = "%s %i.%i";
sprintf(fsm->big_buf_, xref_pattern, fsm->rule_def_->rule_name()->c_str(), fsm->subrule_no_, fsm->elem_no_);
xref_entry += fsm->big_buf_;
string xref_key;
if (sf->p1__->its_t_def()->enum_id() ≡ T_Enum::T_LR1_parallel_operator_) {
  xref_key += "|||";
}
else {
  xref_key += "|t|";
}
fsm->add_symbol_to_xref_map(xref_key, xref_entry);
++fsm->elem_no_;
string xref_rtned_key(sf->p2__->its_t_def()->t_name()->c_str());
string xref_rtned_entry;
sprintf(fsm->big_buf_, xref_pattern, fsm->rule_def_->rule_name()->c_str(), fsm->subrule_no_, fsm->elem_no_);
xref_rtned_entry += fsm->big_buf_;
fsm->add_symbol_to_xref_map(xref_rtned_key, xref_rtned_entry);
++fsm->elem_no_;
string xref_thd_entry;
sprintf(fsm->big_buf_, xref_pattern, fsm->rule_def_->rule_name()->c_str(), fsm->subrule_no_, fsm->elem_no_);
xref_thd_entry += fsm->big_buf_;
string xref_thd_key("NULL thread");
fsm->add_symbol_to_xref_map(xref_thd_key, xref_thd_entry);
```

30. *Relement*'s subrule 6.



⟨ Relement subrule 6 op directive 30 ⟩ ≡

```
Cprt_xrefs_docs * fsm = ( Cprt_xrefs_docs * ) rule_info__.parser__->fsm_tbl__;
++fsm->elem_no_;
string xref_entry;
const char *xref_pattern = "%s %i.%i";
sprintf(fsm->big_buf_, xref_pattern, fsm->rule_def_->rule_name()->c_str(), fsm->subrule_no_, fsm->elem_no_);
xref_entry += fsm->big_buf_;
string xref_key(sf->p1__->its_t_def()->t_name()->c_str());
fsm->add_symbol_to_xref_map(xref_key, xref_entry);
++fsm->elem_no_;
string xref_2_entry;
sprintf(fsm->big_buf_, xref_pattern, fsm->rule_def_->rule_name()->c_str(), fsm->subrule_no_, fsm->elem_no_);
xref_2_entry += fsm->big_buf_;
string xref_2_key(sf->p2__->its_t_def()->t_name()->c_str());
fsm->add_symbol_to_xref_map(xref_2_key, xref_2_entry);
```

31. First Set Language for O_2^{linker}.

```
/*
 File: prt_xrefs_docs.fsc
 Date and Time: Fri Jan  2 15:33:50 2015
*/
transitive   n
grammar-name "prt_xrefs_docs"
name-space   "NS_prt_xrefs_docs"
thread-name  "Cprt_xrefs_docs"
monolithic   y
file-name    "prt_xrefs_docs.fsc"
no-of-T      569
list-of-native-first-set-terminals 1
   rule_def
end-list-of-native-first-set-terminals
list-of-transitive-threads 0
end-list-of-transitive-threads
list-of-used-threads 0
end-list-of-used-threads
fsm-comments
"Output xref doc --- \n‘‘first set’’ per rule, and referenced symbols."
```

32. Lr1 State Network.

⇒ State: 1 state type: ^{s}

←	rule	→	R#	sr#	Po	←	subrule element	→	Brn	Gto	Red	LA
c	Rrule_def		4	1	1	rule-def			1	2	2	
c	Rprt_xrefs_docs		1	1	1	Rrules *eog*			1	3	4	
c	Rrules		2	2	1	Rrules *Rrule*			1	3	5	
c	Rrules		2	1	1	Rrule			1	23	23	
c	Rrule		3	1	1	Rrule_def *Rsubrules*			1	6	8	

⇒$^{rule-def}$ State: 2 state type: ^{r}

←	rule	→	R#	sr#	Po	←	subrule element	→	Brn	Gto	Red	LA
t	Rrule_def		4	1	2				1	0	2	1

⇒^{Rrules} State: 3 state type: ^{s}

←	rule	→	R#	sr#	Po	←	subrule element	→	Brn	Gto	Red	LA
t	Rprt_xrefs_docs		1	1	2	eog			1	4	4	
c	Rrule_def		4	1	1	rule-def			3	2	2	
t	Rrules		2	2	2	Rrule			1	5	5	
c	Rrule		3	1	1	Rrule_def *Rsubrules*			3	6	8	

⇒^{eog} State: 4 state type: ^{r}

←	rule	→	R#	sr#	Po	←	subrule element	→	Brn	Gto	Red	LA
t	Rprt_xrefs_docs		1	1	3				1	0	4	2

⇒^{Rrule} State: 5 state type: ^{r}

←	rule	→	R#	sr#	Po	←	subrule element	→	Brn	Gto	Red	LA
t	Rrules		2	2	3				1	0	5	3

⇒$^{Rrule\_def}$ State: 6 state type: ^{s}

←	rule	→	R#	sr#	Po	←	subrule element	→	Brn	Gto	Red	LA
c	Rsubrule_def		7	1	1	subrule-def			6	7	7	
t	Rrule		3	1	2	Rsubrules			3	8	8	
c	Rsubrules		5	2	1	Rsubrules *Rsubrule*			6	8	9	
c	Rsubrules		5	1	1	Rsubrule			6	22	22	
c	Rsubrule		6	1	1	Rsubrule_def *Relements*			6	10	19	

⇒$^{subrule-def}$ State: 7 state type: ^{r}

←	rule	→	R#	sr#	Po	←	subrule element	→	Brn	Gto	Red	LA
t	Rsubrule_def		7	1	2				6	0	7	4

⇒^{Rsubrules} State: 8 state type: $^{s/r}$

←	rule	→	R#	sr#	Po	←	subrule element	→	Brn	Gto	Red	LA
t	Rrule		3	1	3				3	0	8	3
c	Rsubrule_def		7	1	1	subrule-def			8	7	7	
t	Rsubrules		5	2	2	Rsubrule			6	9	9	
c	Rsubrule		6	1	1	Rsubrule_def *Relements*			8	10	19	

⇒^{Rsubrule} State: 9 state type: ^{r}

←	rule	→	R#	sr#	Po	←	subrule element	→	Brn	Gto	Red	LA
t	Rsubrules		5	2	3				6	0	9	5

⇒*Rsubrule_def* State: 10 state type: *s*

←	rule	→	R#	sr#	Po	←	subrule element	→	Brn	Gto	Red	LA
c	Relement		9	4	1	refered-T			10	11	15	
c	Relement		9	6	1	refered-T			10	11	14	
c	Relement		9	1	1	refered-T			10	11	12	
c	Relement		9	5	1	refered-T			10	11	16	
c	Relement		9	2	1	refered-rule			10	17	17	
c	Relement		9	3	1	eosubrule			10	18	18	
t	Rsubrule		6	1	2	Relements			8	19	19	
c	Relements		8	2	1	Relements *Relement*			10	19	20	
c	Relements		8	1	1	Relement			10	21	21	

⇒*refered−T* State: 11 state type: *s*

←	rule	→	R#	sr#	Po	←	subrule element	→	Brn	Gto	Red	LA
t	Relement		9	1	2	|.|			10	12	12	
t	Relement		9	4	2	refered-T			10	13	15	
t	Relement		9	6	2	refered-T			10	13	14	
t	Relement		9	5	2	refered-T			10	13	16	

⇒\|.\| State: 12 state type: *r*

←	rule	→	R#	sr#	Po	←	subrule element	→	Brn	Gto	Red	LA
t	Relement		9	1	3				10	0	12	6

⇒*refered−T* State: 13 state type: *s*

←	rule	→	R#	sr#	Po	←	subrule element	→	Brn	Gto	Red	LA
t	Relement		9	6	3	|.|			10	14	14	
t	Relement		9	4	3	called thread eosubrule			10	15	15	
t	Relement		9	5	3	null call thread eosubrule			10	16	16	

⇒\|.\| State: 14 state type: *r*

←	rule	→	R#	sr#	Po	←	subrule element	→	Brn	Gto	Red	LA
t	Relement		9	6	4				10	0	14	6

⇒*calledthreadeosubrule* State: 15 state type: *r*

←	rule	→	R#	sr#	Po	←	subrule element	→	Brn	Gto	Red	LA
t	Relement		9	4	4				10	0	15	6

⇒*nullcallthreadeosubrule* State: 16 state type: *r*

←	rule	→	R#	sr#	Po	←	subrule element	→	Brn	Gto	Red	LA
t	Relement		9	5	4				10	0	16	6

⇒*refered−rule* State: 17 state type: *r*

←	rule	→	R#	sr#	Po	←	subrule element	→	Brn	Gto	Red	LA
t	Relement		9	2	2				10	0	17	6

⇒*eosubrule* State: 18 state type: *r*

←	rule	→	R#	sr#	Po	←	subrule element	→	Brn	Gto	Red	LA
t	Relement		9	3	2				10	0	18	6

⇒*Relements* State: 19 state type: *s/r*

←	rule	→	R#	sr#	Po	←	subrule element	→	Brn	Gto	Red	LA

t	Rsubrule	6	1	3		8	0	19	5
c	Relement	9	4	1	refered-T	19	11	15	
c	Relement	9	6	1	refered-T	19	11	14	
c	Relement	9	1	1	refered-T	19	11	12	
c	Relement	9	5	1	refered-T	19	11	16	
c	Relement	9	2	1	refered-rule	19	17	17	
c	Relement	9	3	1	eosubrule	19	18	18	
t	Relements	8	2	2	Relement	10	20	20	

$\Rightarrow^{Relement}$ State: 20 state type: ^{r}

←	rule	→	R#	sr#	Po	←	subrule element	→	Brn	Gto	Red	LA
t	Relements		8	2	3				10	0	20	6

$\Rightarrow^{Relement}$ State: 21 state type: ^{r}

←	rule	→	R#	sr#	Po	←	subrule element	→	Brn	Gto	Red	LA
t	Relements		8	1	2				10	0	21	6

$\Rightarrow^{Rsubrule}$ State: 22 state type: ^{r}

←	rule	→	R#	sr#	Po	←	subrule element	→	Brn	Gto	Red	LA
t	Rsubrules		5	1	2				6	0	22	5

$\Rightarrow^{Rrule}$ State: 23 state type: ^{r}

←	rule	→	R#	sr#	Po	←	subrule element	→	Brn	Gto	Red	LA
t	Rrules		2	1	2				1	0	23	3

33. Index.

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prt_xrefs_docs Grammar

Date: January 2, 2015 at 15:38

File: prt_xrefs_docs.lex

Ns: NS_prt_xrefs_docs

Version: 1.0 Debug: false

Grammar Comments: Type: Monolithic

Output xref doc — "first set" per rule, and referenced symbols.