

Unstable-Languages-beta: SIMPLE-THR-3-Statements *

The PAnCompS Project

SIMPLE-THR-3-Statements.cbs | PLAIN | PRETTY

Language "SIMPLE-THR"

3 Statements

```
Syntax Block : block ::= '{' stmts? '}'  
        Stmts : stmts ::= stmt stmts?  
        Stmt  : stmt  ::= imp-stmt | vars-decl  
        ImpStmt : imp-stmt ::= block  
                                | exp ';'   
                                | 'if' '(' exp ')' block ('else' block)?   
                                | 'while' '(' exp ')' block   
                                | 'for' '(' stmt exp ';' exp ')' block   
                                | 'print' '(' exps ')' ';'   
                                | 'return' exp? ';'   
                                | 'try' block 'catch' '(' id ')' block   
                                | 'throw' exp ';'   
                                | 'join' exp ';'   
                                | 'acquire' exp ';'   
                                | 'release' exp ';'   
                                | 'rendezvous' exp ';' 
```

```
Rule [ [ 'if' '(' Exp ')' Block ] : stmt =  
      [ [ 'if' '(' Exp ')' Block 'else' '{' '}' ] ]
```

```
Rule [ [ 'for' '(' Stmt Exp1 ';' Exp2 ')'   
        '{' Stmts '}' ] ] : stmt =  
      [ [ '{' Stmt   
          'while' '(' Exp1 ')'   
          '{' '{' Stmts '}' Exp2 ';' '}'   
          '}' ] ]
```

*Suggestions for improvement: plancomps@gmail.com.
Reports of issues: <https://github.com/plancomps/CBS-beta/issues>.

Semantics `exec[_ : stmts] : ⇒ null-type`

Rule `exec['{ ' }'] = null`

Rule `exec['{ Stmt }'] = exec[Stmt]`

Rule `exec[ImpStmt Stmt] =`
`sequential(exec[ImpStmt], exec[Stmt])`

Rule `exec[VarsDecl Stmt] =`
`scope(declare[VarsDecl], exec[Stmt])`

Rule `exec[VarsDecl] = effect(declare[VarsDecl])`

Rule `exec[Exp ';'] = effect(rval[Exp])`

Rule `exec['if' '(' Exp ')' Block1 'else' Block2] =`
`if-else(rval[Exp], exec[Block1], exec[Block2])`

Rule `exec['while' '(' Exp ')' Block] = while(rval[Exp], exec[Block])`

Rule `exec['print' '(' Exps ')' ';'] = print(rvals[Exps])`

Rule `exec['return' Exp ';'] = return(rval[Exp])`

Rule `exec['return' ';'] = return(null)`

Rule `exec['try' Block1 'catch' '(' Id ')' Block2] =`
`handle-thrown(`
`exec[Block1],`
`scope(`
`bind(id[Id], allocate-initialised-variable(values, given)),`
`exec[Block2]))`

Rule `exec['throw' Exp ';'] = throw(rval[Exp])`

SIMPLE uses natural numbers to identify threads; the use of `lookup-index(-)` below converts a natural number to the associated thread-id.

Rule `exec['join' Exp ';'] =`
`thread-join lookup-index(rval[Exp])`

The use of `memo-value(V, SY)` below associates V with a lock. When a thread requests a lock already held by another thread, the requesting thread is suspended until the request is granted. The use of `postpone(-)` below automatically releases held locks when the current thread terminates.

Rule `exec['acquire' Exp ';'] =`
`give(`
`memo-value(rval[Exp], reentrant-lock-create),`
`sequential(`
`postpone`
`if-true-else(`
`is-exclusive-lock-holder given,`
`reentrant-lock-release given,`
`null-value),`
`reentrant-lock-sync-else-wait given))`

The use of `memo-value-recall(V)` below gives the lock associated with V .

Rule `exec['release' Exp ';'] =`
`reentrant-lock-exit memo-value-recall rval[Exp]`

The use of `memo-value(V, SY)` below associates V with a rendezvous. When a thread requests a rendezvous on a particular value, and there is no previous uncompleted request for a rendezvous on the same value, the requesting thread is suspended until the request is granted.

Rule `exec['rendezvous' Exp ';'] =`
`rendezvous-sync-else-wait(`
`memo-value("rendezvous", rendezvous-create(2)),`
`rval[Exp])`