

# COMPETITION

MODULE COMPETITION-SYN

SYNTAX  $Decl ::= \text{var } Ids ;$   
|  $\text{mutex } Ints ;$

SYNTAX  $Exp ::= Int$   
|  $Id$   
|  $Bool$   
|  $(Exp) [\text{bracket}]$   
|  $- Exp [\text{strict}]$   
|  $\text{read } ()$   
|  $Exp * Exp [\text{strict}]$   
|  $Exp / Exp [\text{strict}]$   
|  $Exp \% Exp [\text{strict}]$   
|  $Exp + Exp [\text{strict}]$   
|  $Exp - Exp [\text{strict}]$   
|  $Exp < Exp [\text{strict}]$   
|  $Exp \leq Exp [\text{strict}]$   
|  $Exp > Exp [\text{strict}]$   
|  $Exp \geq Exp [\text{strict}]$   
|  $Exp == Exp [\text{strict}]$   
|  $Exp != Exp [\text{strict}]$   
|  $\text{not } Exp [\text{strict}]$   
|  $Exp \&\& Exp [\text{strict}(1)]$   
|  $Exp || Exp [\text{strict}(1)]$   
|  $\text{execute } Block$

SYNTAX  $Ids ::= List\{Id, ", "\}$

SYNTAX  $Exps ::= List\{Exp, ", "\} [\text{strict}]$

SYNTAX  $Ints ::= List\{Int, ", "\}$

SYNTAX  $Block ::= \{\}$   
|  $\{Stmts\}$

SYNTAX  $Stmt ::= Decl$   
|  $Block$   
|  $Exp ; [\text{strict}]$   
|  $Id = Exp ; [\text{strict}(2)]$   
|  $\text{if } (Exp)Block \text{ else } Block [\text{avoid}, \text{strict}(1)]$   
|  $\text{if } (Exp)Block$   
|  $\text{while } (Exp)Block$   
|  $\text{return } Exp ; [\text{strict}]$   
|  $\text{print } (Exp) ; [\text{strict}]$   
|  $\text{lock } Int ; [\text{strict}]$   
|  $\text{unlock } Int ; [\text{strict}]$

SYNTAX  $Stmts ::= Stmt$   
|  $Stmts Stmts$

RULE 
$$\frac{\text{if } (E)S}{\text{if } (E)\bar{S} \text{ else } \{\}} \quad [\text{macro}]$$

END MODULE

MODULE COMPETITION

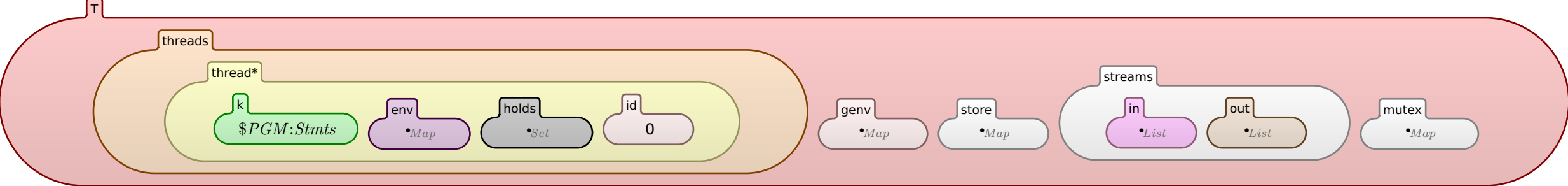
SYNTAX  $Val ::= Int$   
|  $Bool$

SYNTAX  $Vals ::= List\{Val, ", "\}$

SYNTAX  $Exp ::= Val$

SYNTAX  $KResult ::= Val$

CONFIGURATION:



RULE 
$$\frac{\text{not } T:Bool}{\neg Bool(T)}$$

RULE 
$$\frac{\text{true} \&\& E}{E}$$

RULE 
$$\frac{\text{false} \&\& \text{---}}{\text{false}}$$

RULE 
$$\frac{\text{true} || \text{---}}{\text{true}}$$

RULE 
$$\frac{\text{false} || E}{E}$$

RULE 
$$\frac{I1 + I2}{I1 +_{Int} I2}$$

RULE 
$$\frac{I1 - I2}{I1 -_{Int} I2}$$

RULE 
$$\frac{I1 * I2}{I1 *_{Int} I2}$$

RULE 
$$\frac{I1 / I2}{I1 \div_{Int} I2} \quad \text{requires } I2 \neq_{Int} 0$$

RULE 
$$\frac{I1 \% I2}{I1 \%_{Int} I2} \quad \text{requires } I2 \neq_{Int} 0$$

RULE 
$$\frac{- I}{0 -_{Int} I}$$

RULE 
$$\frac{I1 < I2}{I1 <_{Int} I2}$$

RULE 
$$\frac{I1 \leq I2}{I1 \leq_{Int} I2}$$

RULE 
$$\frac{I1 > I2}{I1 >_{Int} I2}$$

RULE 
$$\frac{I1 \geq I2}{I1 \geq_{Int} I2}$$

RULE 
$$\frac{V1:Val == V2:Val}{V1 =_K V2}$$

RULE 
$$\frac{V1:Val != V2:Val}{V1 \neq_K V2}$$

RULE 
$$\frac{\text{if } (\text{true})S \text{ else } \text{---}}{\bar{S}}$$

RULE 
$$\frac{\text{if } (\text{false})\text{---} \text{ else } S}{\bar{S}}$$

RULE 
$$\frac{\text{while } (E)S}{\text{if } (E)\{\bar{S} \text{ while } (E)S\}} \quad [\text{structural}]$$

RULE 
$$\frac{\text{read } ()}{I} \quad \text{in } I:Int \quad \bullet_{List}$$

RULE 
$$\frac{\text{print } (I:Int) ;}{I} \quad \bullet_{List} \quad \text{out } I$$

RULE 
$$\frac{\text{---};Val ;}{\bullet_K}$$

RULE 
$$\frac{\text{lock } I:Int ;}{I ;} \quad \text{holds } \begin{matrix} Holds:Set \\ Holds I \end{matrix} \quad \text{mutex } \begin{matrix} I \mapsto \frac{1}{0} \end{matrix} \quad \text{requires } \neg Bool(I \text{ in } Holds)$$

RULE 
$$\frac{\text{unlock } I:Int ;}{I ;} \quad \text{holds } \begin{matrix} Holds:Set \\ Holds \neg_{Set} I \end{matrix} \quad \text{mutex } \begin{matrix} I \mapsto \frac{0}{1} \end{matrix} \quad \text{requires } (I \text{ in } Holds)$$

RULE 
$$\frac{X:Id}{I:Int} \quad \text{env } X \mapsto L \quad \text{store } L \mapsto I:Int$$

RULE 
$$\frac{\text{execute } S:Block}{T:Int} \quad \text{thread } \begin{matrix} k \\ \text{env } Env:Map \end{matrix} \quad \bullet_{Bag} \quad \text{requires fresh } (T:Int)$$

RULE 
$$\frac{\text{mutex } I:Int, I1:Ints ;}{I1} \quad \text{mutex } \begin{matrix} \mu tex:Map \\ \mu tex[1 / I] \end{matrix}$$

RULE 
$$\frac{\text{var } X:Id, X1:Ids ;}{X1} \quad \text{env } \begin{matrix} \rho:Map \\ \rho[L:Int / X] \end{matrix} \quad \text{store } \begin{matrix} \delta:Map \\ \delta[0 / L] \end{matrix} \quad \text{requires fresh } (L:Int)$$

RULE 
$$\frac{X:Id = I:Int ;}{I ;} \quad \text{env } X \mapsto N:Int \quad \text{store } N \mapsto \frac{\text{---}}{I}$$

RULE 
$$\frac{V:Val ;}{\bullet_K} \quad [\text{structural}]$$

RULE 
$$\frac{\text{var } \bullet_{ids} ;}{\bullet_K} \quad [\text{structural}]$$

RULE 
$$\frac{S1:Stmts \quad S2:Stmts}{S1 \frown S2} \quad [\text{structural}]$$

RULE 
$$\frac{\{S:Stmts\}}{S}$$

END MODULE