

**Files:**

$$\langle \text{LusFile} \rangle \longrightarrow \{ \langle \text{OneDecl} \rangle \}^*$$

$$\langle \text{OneDecl} \rangle \longrightarrow \langle \text{ConstDecl} \rangle \mid \langle \text{TypeDecl} \rangle \mid \langle \text{FuncDecl} \rangle \mid \langle \text{NodeDecl} \rangle$$

**Constant Declarations:**

$$\langle \text{ConstDecl} \rangle \longrightarrow \text{'const'} \{ \langle \text{OneConstDecl} \rangle \text{' ;' } \}^+$$

$$\langle \text{OneConstDecl} \rangle \longrightarrow \{ \langle \text{Idf} \rangle \text{' , ' } \}^* \langle \text{Idf} \rangle \text{' : ' } \langle \text{Idf} \rangle \mid \langle \text{Idf} \rangle \text{' = ' } \langle \text{Exp} \rangle$$

**Type Declarations:**

$$\langle \text{TypeDecl} \rangle \longrightarrow \text{'type'} \{ \langle \text{OneTypeDecl} \rangle \text{' ;' } \}^+$$

$$\langle \text{OneTypeDecl} \rangle \longrightarrow \{ \langle \text{Idf} \rangle \text{' , ' } \}^* \langle \text{Idf} \rangle \mid \langle \text{Idf} \rangle \text{' = ' } \langle \text{Type} \rangle$$

$$\langle \text{Type} \rangle \longrightarrow \langle \text{Idf} \rangle \mid \langle \text{Type} \rangle \text{' ~ ' } \langle \text{Exp} \rangle \mid \text{' [ ' } \{ \langle \text{Type} \rangle \text{' , ' } \}^* \langle \text{Type} \rangle \text{' ] '}$$

**Function Declarations:**

$$\begin{aligned} \langle \text{FuncDecl} \rangle \longrightarrow & \text{'function'} \langle \text{Idf} \rangle \text{' ( ' } \{ \langle \text{VarDecl} \rangle \text{' ;' } \}^* \langle \text{VarDecl} \rangle \text{' ) ' } \\ & \text{'returns'} \text{' ( ' } \{ \langle \text{VarDecl} \rangle \text{' ;' } \}^* \langle \text{VarDecl} \rangle \text{' ) ' } \end{aligned}$$

**Node Declaration:**

$$\begin{aligned} \langle \text{NodeDecl} \rangle \longrightarrow & \text{'node'} \langle \text{Idf} \rangle \text{' ( ' } \{ \langle \text{InParam} \rangle \text{' ;' } \}^* \langle \text{InParam} \rangle \text{' ) ' } \\ & \text{'returns'} \text{' ( ' } \{ \langle \text{ClockedVarDecl} \rangle \text{' ;' } \}^* \langle \text{ClockedVarDecl} \rangle \text{' ) ' } \text{' ;' } \\ & \langle \text{ClockedVarDecl} \rangle \langle \text{Body} \rangle \end{aligned}$$

$$\langle \text{InParam} \rangle \longrightarrow \langle \text{ClockedVarDecl} \rangle \mid \text{'const'} \langle \text{VarDecl} \rangle$$

### Variable Declarations:

$$\begin{aligned}
\langle \text{LocalDecl} \rangle &\longrightarrow \text{empty} \mid \text{'var'} \{ \langle \text{ClockedVarDecl} \rangle \text{' ;' } \}^+ \\
\langle \text{ClockedVarDecl} \rangle &\longrightarrow \langle \text{VarDecl} \rangle \mid \text{'('} \{ \langle \text{VarDecl} \rangle \text{' ;' } \}^* \langle \text{VarDecl} \rangle \text{' )' } \text{'when'} \langle \text{Idf} \rangle \\
\langle \text{VarDecl} \rangle &\longrightarrow \{ \langle \text{Idf} \rangle \text{' ,' } \}^* \langle \text{Idf} \rangle \text{' :' } \langle \text{Type} \rangle
\end{aligned}$$

### Equations:

$$\begin{aligned}
\langle \text{Body} \rangle &\longrightarrow \text{'let'} \{ \langle \text{Equation} \rangle \text{' ;' } \}^+ \text{'tel'} \text{' [' ; ']'} \\
\langle \text{Equation} \rangle &\longrightarrow \text{'assert'} \langle \text{Exp} \rangle \mid \langle \text{LeftPart} \rangle \text{' = ' } \langle \text{Exp} \rangle \\
\langle \text{LeftPart} \rangle &\longrightarrow \{ \langle \text{LeftElem} \rangle \text{' ,' } \}^* \langle \text{LeftElem} \rangle \mid \text{'('} \{ \langle \text{LeftElem} \rangle \text{' ,' } \}^* \langle \text{LeftElem} \rangle \text{' )' } \\
\langle \text{LeftElem} \rangle &\longrightarrow \langle \text{Idf} \rangle \mid \langle \text{StructFilter} \rangle \mid \langle \text{TabAccess} \rangle \\
\langle \text{StructFilter} \rangle &\longrightarrow \text{'['} \{ \langle \text{LeftElem} \rangle \text{' ,' } \}^* \langle \text{LeftElem} \rangle \text{' ]' } \\
\langle \text{TabAccess} \rangle &\longrightarrow \langle \text{Idf} \rangle \langle \text{Selector} \rangle \mid \langle \text{TabAccess} \rangle \langle \text{Selector} \rangle \\
\langle \text{Selector} \rangle &\longrightarrow \text{'['} \langle \text{Exp} \rangle \text{' . . ' } \langle \text{Exp} \rangle \text{' [ 'step' } \langle \text{Exp} \rangle \text{' ] ' ]' }
\end{aligned}$$

### Expressions:

$$\begin{aligned}
\langle \text{Exp} \rangle &\longrightarrow \langle \text{Integer} \rangle \mid \langle \text{Real} \rangle \mid \langle \text{Idf} \rangle \mid \langle \text{Idf} \rangle \text{'('} \{ \langle \text{Exp} \rangle \text{' ,' } \}^* \langle \text{Exp} \rangle \text{' )' } \\
&\mid \text{'('} \{ \langle \text{Exp} \rangle \text{' ,' } \}^* \langle \text{Exp} \rangle \text{' )' } \mid \text{'['} \{ \langle \text{Exp} \rangle \text{' ,' } \}^* \langle \text{Exp} \rangle \text{' ]' } \\
&\mid \langle \text{UnOp} \rangle \langle \text{Exp} \rangle \mid \langle \text{Exp} \rangle \langle \text{BinOp} \rangle \langle \text{Exp} \rangle \mid \langle \text{Exp} \rangle \langle \text{Selector} \rangle \\
&\mid \text{'if'} \langle \text{Exp} \rangle \text{' then' } \langle \text{Exp} \rangle \text{' else' } \langle \text{Exp} \rangle \\
&\mid \text{'with' } \langle \text{Exp} \rangle \text{' then' } \langle \text{Exp} \rangle \text{' else' } \langle \text{Exp} \rangle \\
&\mid \text{'\#'} \text{'('} \{ \langle \text{Exp} \rangle \text{' ,' } \}^* \langle \text{Exp} \rangle \text{' )' } \\
\langle \text{UnOp} \rangle &\longrightarrow \text{'not'} \mid \text{'-'} \mid \text{'pre'} \mid \text{'current'} \\
\langle \text{BinOp} \rangle &\longrightarrow \text{'->'} \mid \text{'when'} \mid \text{'or'} \mid \text{'xor'} \mid \text{'and'} \mid \text{'=>'} \\
&\mid \text{'='} \mid \text{'<>'} \mid \text{'<'} \mid \text{'>'} \mid \text{'<='} \mid \text{'>='} \\
&\mid \text{'+'} \mid \text{'-'} \mid \text{'*'} \mid \text{'/'} \mid \text{'div'} \mid \text{'mod'} \mid \text{'\^{'}} \mid \text{'|'}
\end{aligned}$$