The Language LAMA

BNF-converter

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This document was automatically generated by the *BNF-Converter*. It was generated together with the lexer, the parser, and the abstract syntax module, which guarantees that the document matches with the implementation of the language (provided no hand-hacking has taken place).

The lexical structure of LAMA

Literals

Integer literals ⟨*Int*⟩ are nonempty sequences of digits.

Identifier literals are recognized by the regular expression (⟨*letter*⟩ | '_')(⟨*letter*⟩ | ⟨*digit*⟩ | '_')∗

StateId literals are recognized by the regular expression (⟨*letter*⟩ | '_')(⟨*letter*⟩ | ⟨*digit*⟩ | '_') ∗ '"

Reserved words and symbols

The set of reserved words is the set of terminals appearing in the grammar. Those reserved words that consist of non-letter characters are called symbols, and they are treated in a different way from those that are similar to identifiers. The lexer follows rules familiar from languages like Haskell, C, and Java, including longest match and spacing conventions.

The reserved words used in LAMA are the following:

```
and          assertion    automaton
bool         constants    default
definition   div          edge
enum         false        initial
int          invariant    ite
let          local        location
match        mod          node
nodes        not          or
output       project      real
returns      sint         state
tel          transition   true
typedef      uint         use
xor
```

The symbols used in LAMA are the following:

```
;   =    {
}   ,    ^
(   #    )
[   ]    -
/   :    .
_   =>   <
>   <=   >=
+   *
```

Comments

Single-line comments begin with $--$.
There are no multiple-line comments in the grammar.

The syntactic structure of LAMA

Non-terminals are enclosed between $\langle$ and $\rangle$. The symbols ::= (production), | (union) and ϵ (empty rule) belong to the BNF notation. All other symbols are terminals.

$\langle Program \rangle$ ::= $\langle TypeDefs \rangle$ $\langle ConstantDefs \rangle$
$\langle Declarations \rangle$ $\langle Flow \rangle$ $\langle Initial \rangle$
$\langle Assertion \rangle$ $\langle Invariant \rangle$

$\langle TypeDefs \rangle$ ::= ϵ
| `typedef` $\langle ListTypeDef \rangle$

⟨*ListTypeDef*⟩ ::= ⟨*TypeDef*⟩ `;`
| ⟨*TypeDef*⟩ `;` ⟨*ListTypeDef*⟩

⟨*TypeDef*⟩ ::= `enum` ⟨*Identifier*⟩ = { ⟨*ListEnumConstr*⟩ }

⟨*EnumConstr*⟩ ::= ⟨*Identifier*⟩

⟨*ListEnumConstr*⟩ ::= ⟨*EnumConstr*⟩
| ⟨*EnumConstr*⟩ `,` ⟨*ListEnumConstr*⟩

⟨*Type*⟩ ::= ⟨*BaseType*⟩
| ⟨*Identifier*⟩
| ⟨*BaseType*⟩ `^` ⟨*Natural*⟩
| `(` `#` ⟨*ListType*⟩ `)`

⟨*ListType*⟩ ::= ⟨*Type*⟩
| ⟨*Type*⟩ ⟨*ListType*⟩

⟨*BaseType*⟩ ::= `bool`
| `int`
| `real`
| `sint` `[` ⟨*Natural*⟩ `]`
| `uint` `[` ⟨*Natural*⟩ `]`

⟨*ConstantDefs*⟩ ::= ϵ
| `constants` ⟨*ListConstantDef*⟩

⟨*ListConstantDef*⟩ ::= ⟨*ConstantDef*⟩ `;`
| ⟨*ConstantDef*⟩ `;` ⟨*ListConstantDef*⟩

⟨*ConstantDef*⟩ ::= ⟨*Identifier*⟩ = ⟨*Constant*⟩

⟨*Natural*⟩ ::= ⟨*Integer*⟩

⟨*IntegerConst*⟩ ::= ⟨*Integer*⟩
| `(` − ⟨*Integer*⟩ `)`

⟨*Constant*⟩ ::= ⟨*BoolV*⟩
| ⟨*IntegerConst*⟩
| ⟨*IntegerConst*⟩ `/` ⟨*IntegerConst*⟩
| `sint` `[` ⟨*Natural*⟩ `]` `(` ⟨*IntegerConst*⟩ `)`
| `uint` `[` ⟨*Natural*⟩ `]` `(` ⟨*Natural*⟩ `)`

⟨*BoolV*⟩ ::= `true`
| `false`

⟨*Initial*⟩ ::= ϵ
| `initial` ⟨*ListStateInit*⟩ `;`

⟨*Assertion*⟩ ::= ϵ
| `assertion` ⟨*Expr*⟩ `;`

⟨*Invariant*⟩ ::= ϵ
| `invariant` ⟨*Expr*⟩ `;`

⟨*ListStateInit*⟩ ::= ⟨*StateInit*⟩
| ⟨*StateInit*⟩ `,` ⟨*ListStateInit*⟩

⟨*StateInit*⟩ ::= ⟨*Identifier*⟩ = ⟨*ConstExpr*⟩

⟨*ConstExpr*⟩ ::= ⟨*Expr*⟩

⟨*ListIdentifier*⟩ ::= ⟨*Identifier*⟩
| ⟨*Identifier*⟩ `,` ⟨*ListIdentifier*⟩

⟨*TypedVars*⟩ ::= ⟨*ListIdentifier*⟩ `:` ⟨*Type*⟩

⟨*ListTypedVars*⟩ ::= ⟨*TypedVars*⟩
| ⟨*TypedVars*⟩ `;` ⟨*ListTypedVars*⟩

⟨*MaybeTypedVars*⟩ ::= ϵ
| ⟨*ListTypedVars*⟩

⟨*Node*⟩ ::= `node` ⟨*Identifier*⟩ `(` ⟨*MaybeTypedVars*⟩ `)` `returns` `(` ⟨*ListTypedVars*⟩ `)` `;`
`let`
⟨*Declarations*⟩
⟨*Flow*⟩
⟨*Outputs*⟩
⟨*ControlStructure*⟩
⟨*Initial*⟩
⟨*Assertion*⟩
`tel`

⟨*ListNode*⟩ ::= ⟨*Node*⟩
| ⟨*Node*⟩ ⟨*ListNode*⟩

⟨*Declarations*⟩ ::= ⟨*NodeDecls*⟩ ⟨*LocalDecls*⟩ ⟨*StateDecls*⟩

⟨*VarDecls*⟩ ::= ⟨*TypedVars*⟩ `;`
| ⟨*TypedVars*⟩ `;` ⟨*VarDecls*⟩

⟨*NodeDecls*⟩ ::= ϵ
| `nodes` ⟨*ListNode*⟩

⟨*LocalDecls*⟩ ::= ϵ
| `local` ⟨*VarDecls*⟩

⟨*StateDecls*⟩ ::= ϵ
| `state` ⟨*VarDecls*⟩

⟨*Flow*⟩ ::= ⟨*LocalDefinitions*⟩ ⟨*Transitions*⟩

⟨*LocalDefinitions*⟩ ::= ϵ
| `definition` ⟨*ListInstantDefinition*⟩

⟨*Transitions*⟩ ::= ϵ
| `transition` ⟨*ListTransition*⟩

⟨*Outputs*⟩ ::= ϵ
| `output` ⟨*ListInstantDefinition*⟩

⟨*ListInstantDefinition*⟩ ::= ⟨*InstantDefinition*⟩ `;`
| ⟨*InstantDefinition*⟩ `;` ⟨*ListInstantDefinition*⟩

⟨*ListTransition*⟩ ::= ⟨*Transition*⟩ `;`
| ⟨*Transition*⟩ `;` ⟨*ListTransition*⟩

⟨*InstantDefinition*⟩ ::= ⟨*Identifier*⟩ = ⟨*Expr*⟩
| ⟨*Identifier*⟩ = `(` `use` ⟨*Identifier*⟩ ⟨*ListExpr*⟩ `)`

⟨*Transition*⟩ ::= ⟨*StateId*⟩ = ⟨*Expr*⟩

⟨*ControlStructure*⟩ ::= ⟨*ListAutomaton*⟩

⟨*Automaton*⟩ ::= `automaton` `let` ⟨*ListLocation*⟩ ⟨*InitialLocation*⟩ ⟨*ListEdge*⟩ ⟨*Defaults*⟩ `tel`

⟨*Location*⟩ ::= `location` ⟨*Identifier*⟩ `let` ⟨*Flow*⟩ `tel`

⟨*InitialLocation*⟩ ::= `initial` ⟨*Identifier*⟩ `;`

⟨*Edge*⟩ ::= `edge` `(` ⟨*Identifier*⟩ `,` ⟨*Identifier*⟩ `)` `:` ⟨*Expr*⟩ `;`

⟨*ListLocation*⟩ ::= ⟨*Location*⟩
| ⟨*Location*⟩ ⟨*ListLocation*⟩

⟨*ListEdge*⟩ ::= ⟨*Edge*⟩
| ⟨*Edge*⟩ ⟨*ListEdge*⟩

⟨*ListAutomaton*⟩ ::= ϵ
| ⟨*Automaton*⟩ ⟨*ListAutomaton*⟩

⟨*Defaults*⟩ ::= ϵ
| `default` ⟨*ListDefault*⟩ `;`

⟨*ListDefault*⟩ ::= ⟨*Default*⟩
| ⟨*Default*⟩ `,` ⟨*ListDefault*⟩

⟨*Default*⟩ ::= ⟨*Identifier*⟩ = ⟨*Expr*⟩

⟨*Atom*⟩ ::= ⟨*Constant*⟩
| ⟨*Identifier*⟩

⟨*Expr*⟩ ::= ⟨*Atom*⟩
| `(` ⟨*UnOp*⟩ ⟨*Expr*⟩ `)`
| `(` ⟨*BinOp*⟩ ⟨*Expr*⟩ ⟨*Expr*⟩ `)`
| `(` ⟨*TernOp*⟩ ⟨*Expr*⟩ ⟨*Expr*⟩ ⟨*Expr*⟩ `)`
| `(` `#` ⟨*ListExpr*⟩ `)`
| `(` `project` ⟨*Identifier*⟩ ⟨*Natural*⟩ `)`
| `(` `match` ⟨*Expr*⟩ `{` ⟨*ListPattern*⟩ `}` `)`

⟨*ListExpr*⟩ ::= ϵ
| ⟨*Expr*⟩ ⟨*ListExpr*⟩

⟨*ListPattern*⟩ ::= ⟨*Pattern*⟩
| ⟨*Pattern*⟩ `,` ⟨*ListPattern*⟩

⟨*Pattern*⟩ ::= ⟨*PatHead*⟩ `.` ⟨*Expr*⟩

⟨*PatHead*⟩ ::= ⟨*EnumConstr*⟩
| `_`

⟨*List2Id*⟩ ::= ⟨*Identifier*⟩ ⟨*Identifier*⟩
| ⟨*Identifier*⟩ ⟨*List2Id*⟩

⟨*UnOp*⟩ ::= `not`

⟨*BinOp*⟩ ::= `or`
| `and`
| `xor`
| =>
| =
| <
| >
| <=
| >=
| +
| −
| `*`
| `/`
| `div`
| `mod`

⟨*TernOp*⟩ ::= `ite`