Formal Grammar

31st October, 2019 (v1)

Noel Arteche

```
formula_family → name
                 type
                 parameters
                 variables
                 blocks
                 quantifiers
                 quantifier_prefix
                 operators
                 output

          name → name: [a-zA-Z0-9](_?\s?[a-zA-Z0-9])*

          type → type: CNF
               | type: circuit

    parameters → parameters: parameter_declaration

parameter_declaration → param_name : param_type
                        param_constraints
                        parameter_declaration
                      | ε

    param_type → natural

param_contraints → , param_name <= arithmetic_expression
                   param_constraints
                 | , param_name >= arithmetic_expression
                   param_constraints

     variables → variables: variable_declaration

variable_declaration → var_name subindices
                       variable_declaration
                     | ε

     subindices → (subindices_list) subindices_constraints

subindices_list → index more_subindices

more_subindices → , subindices_list
                | ε

       in_range → subindices_list in range

          range → [arithmetic_expression,
                  arithmetic_expression]

         blocks → blocks: block_definition

block_definition → define block
```

```
                                single_block
                              block_definition
                            | define blocks
                                multiple_blocks
                              subindices_constraints
                              grouped_in
                              block_definition
                            | ε

      single_block  →       block_name := block_body

    multiple_blocks  →      single_block
                            multiple_blocks
                          | ε

      block_body  →         block_name more_names
                          | -block_name more_names
                          | variable_name more_names
                          | -variable_name more_names

      more_names  →         , block_body
                          | ε

subindices_constraints  →   where constraints
                          | ε

      constraints  →        constraint more_contraints
                            constraint and constraint more_constraints
                            Constraint or constraint more_constraint

        contraint  →        in_range
                            assignment
                            expression

  more_constraints  →       , constraints

        grouped_in  →       grouped in block_name
                          | ε

      quantifiers  →        quantifiers: quantifier_declaration

quantifier_declaration      block block_name quantified with quantifier
                            quantifier_declaration
                            blocks in block_name quantified with
                            quantifier
                            quantifier_declaration
                          | ε

      quantifier  →         E
                          | A

  quantifier_prefix  →      quantifier prefix: block_name

       operators  →         operators: operator_declaration
                          | ε
```

operator_declaration → **block** block_name **has operator** op operator_declaration
| **blocks in** block_name **have operator** op operator_declaration
| ε

op → **AND**
| **OR**
| **XOR**

output → **output:** block_name

param_name → *[a-zA-Z](_?[a-zA-Z0-9])**

var_name → *[a-z](_?[a-z0-9])**

index → *[a-z](_?[a-z0-9])**

block_name → *[A-Z](_?[a-zA-Z0-9])**

expression → expression **==** expression
expression **!=** expression
expression **<=** expression
expression **<** expression
expression **>=** expression
expression **>** expression
expression **+** expression
expression **-** expression
expression ***** expresión
expression **/** expression
expression **mod** expression
param_name
index

assignment → index **=** expression