Manual Tecnico

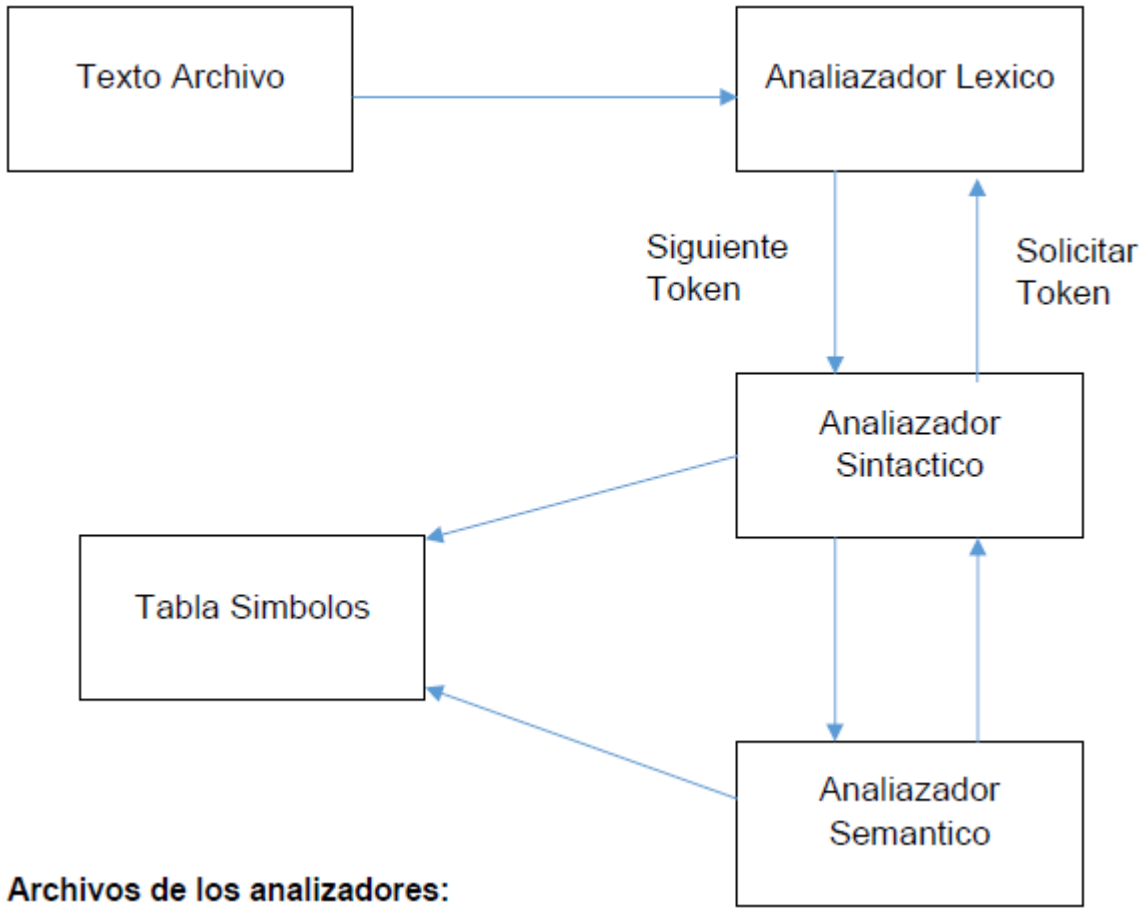
Requerimientos

- Angular >16
- Jison
- Nodejs
- Expresjs
- Typescript
- gcc 11
- OS Linux Debian 21

Descripcion del Program

El programa cuenta con un analizador léxico y sintáctico. Estos se usan para determinar los objetos que se crearán para integración del componente del programa. Cuenta con un analizador para todo el conjunto de archivos.

Los archivos de lectura para los analizadores son de extensión .java la gramática del archivo tiene una estructura del lenguaje Java. De esta manera se implementa el sistema de lectura de los analizadores. Ya que el programa está hecho el Lenguaje Typescript, se utilizan la herramienta de Jison para la creación de analizador.



Archivos de los analizadores:

gramm-main.jison

analyzer_xml.jison

Implementación del IDE

El ide cuenta con una ventana, en esta se agrega el código fuente, para posteriormente este sea analizada, y en caso de que existan errores abrirá una ventana de errores.

El IDE fue hecho con el programa Visual Studio Code

Se utilizo las tecnologías TI:

Frontend: Angular, Typescript

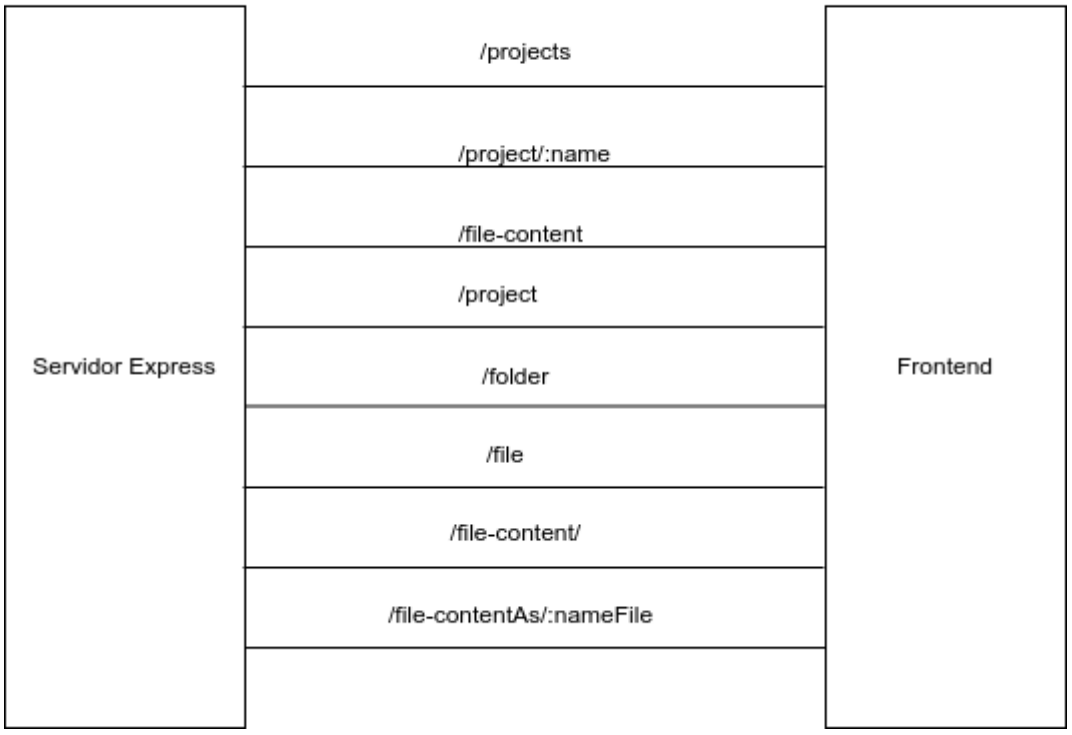
Backend: Nodejs, Typescript, javascript, jison

En el código fuente o el proyecto se encuentran las carpetas de las Compiler3D y CompilerServer utilizadas para el programa.

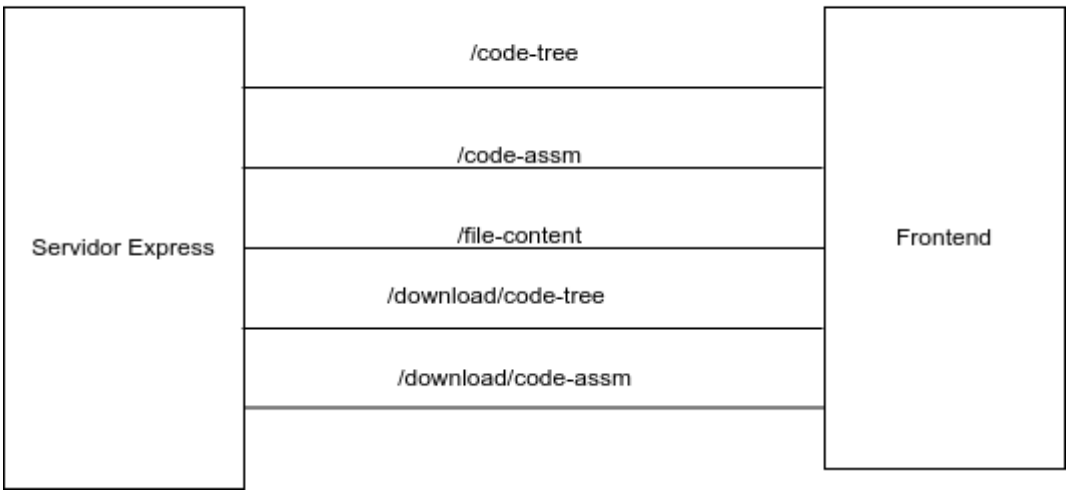
Se utilizo la plataforma Linux como prueba del funcionamiento del sistema.

Diagramas

Manejo de Archivos



Generacion y Descarga de Codigo



Gramática

La gramatica esta compuesta por

Expresiones Regulares

Token	Nombre de Expresion
&&	and
||	or
!	not
.	period
:	colon
,	comma
;	semicolon
(	parentheses_l
)	parentheses_r
[	brackets_l
]	brackets_r
{	keys_l
}	keys_r
=	equal_mark
Math.abs	math_abs
Math.ceil	math_ceil
Math.floor	math_floor
Math.round	math_round
Math.max	math_max
Math.min	math_min
Math.pow	math_pow
Math.sqrt	math_sqrt
Math.random	math_random
Math.toRadians	math_toradians
Math.acos	math_acos
Math.sin	math_sin
Math.atan	math_atan
Math.exp	math_exp
package	package_rsv
import	import_rsv
public	public

private	private
class	class
final	final
static	static
extends	extends
void	void
this.	this
new	new
VERDADERO	VERDADERO
FALSO	FALSO
System.out.println	println
System.out.print	printf
while	while
do	do
if	if
else	else
for	for
switch	switch
case	case
break	break
default	default
continue	continue
return	return
.equals	equals
toString	tostring
var	var
null	null
@Getter	getter
@Setter	setter
@Override	override

Reglas Gramaticales

Reglas gramaticales utilizadas en jison

```
ini
    :CODE_INIT EOF
;
```

```
CODE_INIT
    :STRUCT_CLASS_FULL
    |STATE_COMMENT CODE_INIT
    |
;

CODE
    :STRUCT_MAIN
    |STRUCT_CLASS
    |
;

CODE_LAST
    :CODE_LAST STATE_COMMENT
    |
;

STRUCT_CLASS_FULL
    :STATE_PACKAGE CODE_IMPORT STRUCT_MAIN CODE_LAST
    |STATE_PACKAGE CODE_IMPORT STRUCT_CLASS CODE_LAST
    |STATE_PACKAGE CODE_IMPORT
;

CODE_IMPORT
    :CODE_IMPORT STATE_COMMENT
    |CODE_IMPORT STATE_IMPORT
    |
;

STATE_PACKAGE
    :package_rsv STRUCT_PACKAGE semicolon
;

STRUCT_PACKAGE
    :STRUCT_PACKAGE period id
    |id
;

STATE_IMPORT
    :import_rsv STRUCT_IMPORT semicolon
    |import_rsv STRUCT_IMPORT period mult semicolon
;
```

```
STRUCT_IMPORT
   :STRUCT_IMPORT period id
   |id
;


DATATYPE_PRIMITIVE
   :float
   |int
   |char
   |string
   |boolean
;

STATE_FINAL
   :final
   |
;

STATE_STATIC
   :static
   |
;

STATE_PUBLIC
   :public
   |
;

STATE_PRIVATE
   :private
   |
;

STATE_ENCAP
   :private
   |public
   |
;

STATE_COMMENT
   :block_comment
   |simple_comment
```

```
;

DATA_VALUE
   :decimal_primitive
   |integer_primitive
   |char_primitive
   |true
   |false
   |string_primitive
   |id
   |this id
   |null
   |STRUCT_CALL_FUNCTION
   |STRUCT_CALL_ARRAY
   |STRUCT_CALL_OBJECT_VALUE
   |STRUCT_CALL_FUNC_MATH
;


ARITHMETIC_OPERATION
   :ARITHMETIC_OPERATION plus ARITHMETIC_OPERATION
   |ARITHMETIC_OPERATION minus ARITHMETIC_OPERATION
   |ARITHMETIC_OPERATION div ARITHMETIC_OPERATION
   |ARITHMETIC_OPERATION mult ARITHMETIC_OPERATION
   |ARITHMETIC_OPERATION mod ARITHMETIC_OPERATION
   |minus ARITHMETIC_OPERATION %prec UMINUS
   |parentheses_l ARITHMETIC_OPERATION parentheses_r
   |DATA_VALUE
;

RATIONAL_OPERATION
   :STATE_RATIONAL_OP equals_equals STATE_RATIONAL_OP
   |STATE_RATIONAL_OP equals STATE_RATIONAL_OP
   |STATE_RATIONAL_OP inequality STATE_RATIONAL_OP
   |STATE_RATIONAL_OP less_than STATE_RATIONAL_OP
   |STATE_RATIONAL_OP less_equals STATE_RATIONAL_OP
   |STATE_RATIONAL_OP greater_than STATE_RATIONAL_OP
   |STATE_RATIONAL_OP greater_equals STATE_RATIONAL_OP
;

STATE_RATIONAL_OP
   :RATIONAL_OPERATION
   |parentheses_l RATIONAL_OPERATION parentheses_r
```

```
    |ARITHMETIC_OPERATION
  ;

  LOGICAL_OPERATION
    :STATE_LOGICAL_OP and STATE_LOGICAL_OP
    |STATE_LOGICAL_OP or STATE_LOGICAL_OP
    |not STATE_LOGICAL_OP
  ;

  STATE_LOGICAL_OP
    :LOGICAL_OPERATION
    |parentheses_l LOGICAL_OPERATION parentheses_r
    |STATE_RATIONAL_OP
    |error
  ;

  STATE_VALUE
    :STATE_LOGICAL_OP
  ;


  STRUCT_MAIN
    :void main parentheses_l parentheses_r keys_l BLOCK_CONTENT_MAIN
keys_r


    |error main parentheses_l parentheses_r keys_l BLOCK_CONTENT_MAIN
keys_r
    |void main error keys_l BLOCK_CONTENT_MAIN keys_r
  ;

  BLOCK_CONTENT_MAIN
    :BLOCK_CONTENT_MAIN STATE_DECLARATION_VAR
    |BLOCK_CONTENT_MAIN STATE_DECLARATION_VAR_ARRAY
    |BLOCK_CONTENT_MAIN STATE_DECLARATION_OBJECT_VAR
    |BLOCK_CONTENT_MAIN STATE_DECLARATION_OBJECT_VAR_ARRAY
    |BLOCK_CONTENT_MAIN STRUCT_ASIGNATION_VAR
    |BLOCK_CONTENT_MAIN STRUCT_ASIGNATION_VAR_ARRAY
    |BLOCK_CONTENT_MAIN STATE_COMMENT
    |BLOCK_CONTENT_MAIN STRUCT_VAR
    |BLOCK_CONTENT_MAIN STATE_CALL_FUNCTION
    |BLOCK_CONTENT_MAIN STATE_COND_IF_ELSEIF_ELSE
    |BLOCK_CONTENT_MAIN STATE_SWITCH
```

```
    |BLOCK_CONTENT_MAIN STATE_FOR
    |BLOCK_CONTENT_MAIN STATE_WHILE
    |BLOCK_CONTENT_MAIN STATE_DO_WHILE
    |BLOCK_CONTENT_MAIN STATE_MATH
    |BLOCK_CONTENT_MAIN STATE_BREAK
    |BLOCK_CONTENT_MAIN STATE_CONTINUE
    |BLOCK_CONTENT_MAIN STATE_PRINTS
    |BLOCK_CONTENT_MAIN STRUCT_INPUT
    |BLOCK_CONTENT_MAIN STATE_RETURN
    |BLOCK_CONTENT_MAIN STATE_TOSTRING
    |
  ;




  STRUCT_CLASS
    :public class id STRUCT_EXTENDS keys_l CODE_CLASS keys_r

    |public final class id STRUCT_EXTENDS keys_l CODE_CLASS keys_r


    |class id STRUCT_EXTENDS keys_l CODE_CLASS keys_r

    |final class id STRUCT_EXTENDS keys_l CODE_CLASS keys_r


    |getter setter public class id STRUCT_EXTENDS keys_l CODE_CLASS
keys_r

    |getter setter public final class id STRUCT_EXTENDS keys_l
CODE_CLASS keys_r

    |getter setter class id STRUCT_EXTENDS keys_l CODE_CLASS keys_r

    |getter setter final class id STRUCT_EXTENDS keys_l CODE_CLASS
keys_r


    |setter getter public class id STRUCT_EXTENDS keys_l CODE_CLASS
keys_r
```

```
     |setter getter public final class id STRUCT_EXTENDS keys_l
CODE_CLASS keys_r

     |setter getter class id STRUCT_EXTENDS keys_l CODE_CLASS keys_r

     |setter getter final class id STRUCT_EXTENDS keys_l CODE_CLASS
keys_r


     |getter public class id STRUCT_EXTENDS keys_l CODE_CLASS keys_r

     |getter public final class id STRUCT_EXTENDS keys_l CODE_CLASS
keys_r

     |getter class id STRUCT_EXTENDS keys_l CODE_CLASS keys_r

     |getter final class id STRUCT_EXTENDS keys_l CODE_CLASS keys_r


     |setter public class id STRUCT_EXTENDS keys_l CODE_CLASS keys_r

     |setter public final class id STRUCT_EXTENDS keys_l CODE_CLASS
keys_r

     |setter class id STRUCT_EXTENDS keys_l CODE_CLASS keys_r

     |setter final class id STRUCT_EXTENDS keys_l CODE_CLASS keys_r


     |error class id STRUCT_EXTENDS keys_l CODE_CLASS keys_r
  ;

  STRUCT_EXTENDS
     :extends id
     |

     |extends error
  ;

  CODE_CLASS
     :CODE_CLASS STATE_DECLARATION_ATRIB
     |CODE_CLASS STATE_DECLARATION_ATRIB_ARRAY
     |CODE_CLASS STATE_DECLARATION_OBJECT_ATRIB
```

```
    |CODE_CLASS STATE_DECLARATION_OBJECT_ATRIB_ARRAY
    |CODE_CLASS STRUCT_ASIGNATION_VAR
    |CODE_CLASS STRUCT_ASIGNATION_VAR_ARRAY
    |CODE_CLASS STATE_COMMENT
    |CODE_CLASS STRUCT_MAIN
    |CODE_CLASS STATE_FUNCTION
    |CODE_CLASS STATE_METOD
    |CODE_CLASS STATE_CONSTRUCTOR
    |
;


STATE_DECLARATION_ATRIB
   :STRUCT_DECLARATION_ATRIB semicolon

   |getter STRUCT_DECLARATION_ATRIB semicolon

   |setter STRUCT_DECLARATION_ATRIB semicolon

   |getter setter STRUCT_DECLARATION_ATRIB semicolon

   |setter getter STRUCT_DECLARATION_ATRIB semicolon


   |private STRUCT_DECLARATION_ATRIB semicolon

   |getter private STRUCT_DECLARATION_ATRIB semicolon

   |setter private STRUCT_DECLARATION_ATRIB semicolon

   |getter setter private STRUCT_DECLARATION_ATRIB semicolon

   |setter getter private STRUCT_DECLARATION_ATRIB semicolon


   |public STRUCT_DECLARATION_ATRIB semicolon

   |getter public STRUCT_DECLARATION_ATRIB semicolon

   |setter public STRUCT_DECLARATION_ATRIB semicolon

   |getter setter public STRUCT_DECLARATION_ATRIB semicolon
```

```
    |setter getter public STRUCT_DECLARATION_ATRIB semicolon


    |error public STRUCT_DECLARATION_ATRIB semicolon

;

STRUCT_DECLARATION_ATRIB
    :STRUCT_DECLARATION_ATRIB comma id STATE_ASIGNATION_ATRIB

    |final static DATATYPE_PRIMITIVE id STATE_ASIGNATION_ATRIB

    |static final DATATYPE_PRIMITIVE id STATE_ASIGNATION_ATRIB

    |final DATATYPE_PRIMITIVE id STATE_ASIGNATION_ATRIB
    |static DATATYPE_PRIMITIVE id STATE_ASIGNATION_ATRIB

    |DATATYPE_PRIMITIVE id STATE_ASIGNATION_ATRIB


    |error DATATYPE_PRIMITIVE id STATE_ASIGNATION_ATRIB
    |error STATE_ASIGNATION_ATRIB
;

STATE_ASIGNATION_ATRIB
    :equal_mark ASIGNATION_ATRIB
    |

    |error ASIGNATION_ATRIB
;

ASIGNATION_ATRIB
    :STATE_VALUE
;


//ARREGLOS
STATE_DECLARATION_ATRIB_ARRAY
    :STRUCT_DECLARATION_ATRIB_ARRAY semicolon

    |getter STRUCT_DECLARATION_ATRIB_ARRAY semicolon

    |setter STRUCT_DECLARATION_ATRIB_ARRAY semicolon
```

```
    |getter setter STRUCT_DECLARATION_ATRIB_ARRAY semicolon

    |setter getter STRUCT_DECLARATION_ATRIB_ARRAY semicolon


    |private STRUCT_DECLARATION_ATRIB_ARRAY semicolon

    |getter private STRUCT_DECLARATION_ATRIB_ARRAY semicolon

    |setter private STRUCT_DECLARATION_ATRIB_ARRAY semicolon

    |getter setter private STRUCT_DECLARATION_ATRIB_ARRAY semicolon

    |setter getter private STRUCT_DECLARATION_ATRIB_ARRAY semicolon


    |public STRUCT_DECLARATION_ATRIB_ARRAY semicolon

    |getter public STRUCT_DECLARATION_ATRIB_ARRAY semicolon

    |setter public STRUCT_DECLARATION_ATRIB_ARRAY semicolon

    |getter setter public STRUCT_DECLARATION_ATRIB_ARRAY semicolon

    |setter getter public STRUCT_DECLARATION_ATRIB_ARRAY semicolon


    |error public STRUCT_DECLARATION_ATRIB_ARRAY semicolon
  ;

  STRUCT_DECLARATION_ATRIB_ARRAY
    :STRUCT_DECLARATION_ATRIB_ARRAY comma STRUCT_EMPTY_DIMS_VAR_ARRAY
id STATE_ASIGNATION_VAR_ARRAY

    |final static DATATYPE_PRIMITIVE STRUCT_EMPTY_DIMS_VAR_ARRAY id
STATE_ASIGNATION_VAR_ARRAY

    |static final DATATYPE_PRIMITIVE STRUCT_EMPTY_DIMS_VAR_ARRAY id
STATE_ASIGNATION_VAR_ARRAY

    |final DATATYPE_PRIMITIVE STRUCT_EMPTY_DIMS_VAR_ARRAY id
STATE_ASIGNATION_VAR_ARRAY
```

```
     |static DATATYPE_PRIMITIVE STRUCT_EMPTY_DIMS_VAR_ARRAY id
STATE_ASIGNATION_VAR_ARRAY

     |DATATYPE_PRIMITIVE STRUCT_EMPTY_DIMS_VAR_ARRAY id
STATE_ASIGNATION_VAR_ARRAY


     |error STRUCT_EMPTY_DIMS_VAR_ARRAY id STATE_ASIGNATION_VAR_ARRAY
     |DATATYPE_PRIMITIVE error id STATE_ASIGNATION_VAR_ARRAY
     |DATATYPE_PRIMITIVE STRUCT_EMPTY_DIMS_VAR_ARRAY error
STATE_ASIGNATION_VAR_ARRAY
  ;



  STATE_DECLARATION_VAR
     :STRUCT_DECLARATION_VAR semicolon

  ;

  STRUCT_DECLARATION_VAR
     :STRUCT_DECLARATION_VAR comma id STATE_ASIGNATION_VAR

     |final DATATYPE_PRIMITIVE id STATE_ASIGNATION_VAR

     |DATATYPE_PRIMITIVE id STATE_ASIGNATION_VAR


     |error id STATE_ASIGNATION_VAR
     |DATATYPE_PRIMITIVE error STATE_ASIGNATION_VAR
  ;

  STATE_ASIGNATION_VAR
     :equal_mark ASIGNATION_VAR
     |

     |error ASIGNATION_VAR
  ;

  ASIGNATION_VAR
     :STATE_VALUE
  ;
```

```
  STRUCT_ASIGNATION_VAR
     :id equal_mark ASIGNATION_VAR semicolon
     |id plus_plus semicolon

     |id minus_minus semicolon

     //Cuando es un objeto
     |id period id equal_mark ASIGNATION_VAR semicolon

     |id period id equal_mark new id parentheses_l parentheses_r
semicolon

     |id period id equal_mark new id parentheses_l STATE_PARAM_OBJECT
parentheses_r semicolon



     |id period id equal_mark VALUE_ARRAY_STATE semicolon

     |id period id equal_mark new DATATYPE_PRIMITIVE
STRUCT_VALUE_DIMS_VAR_ARRAY semicolon

     |id period id equal_mark new id STRUCT_VALUE_DIMS_VAR_ARRAY
semicolon



     |id equal_mark new id parentheses_l parentheses_r semicolon

     |id equal_mark new id parentheses_l STATE_PARAM_OBJECT
parentheses_r semicolon


     //CUANDO ES UN ARREGLO
     |id equal_mark VALUE_ARRAY_STATE semicolon
     |id equal_mark new DATATYPE_PRIMITIVE STRUCT_VALUE_DIMS_VAR_ARRAY
semicolon

     |id equal_mark new id STRUCT_VALUE_DIMS_VAR_ARRAY semicolon
```

```
     //PARA LOS TRIBUTOS
     |this id equal_mark ASIGNATION_VAR semicolon
     |this id plus_plus semicolon

     |this id minus_minus semicolon


     //Cuando es un objeto
     |this id period id equal_mark ASIGNATION_VAR semicolon
     |this id period id equal_mark new id parentheses_l parentheses_r
semicolon

     |this id period id equal_mark new id parentheses_l
STATE_PARAM_OBJECT parentheses_r semicolon


     |this id period id equal_mark VALUE_ARRAY_STATE semicolon

     |this id period id equal_mark new DATATYPE_PRIMITIVE
STRUCT_VALUE_DIMS_VAR_ARRAY semicolon

     |this id period id equal_mark new id STRUCT_VALUE_DIMS_VAR_ARRAY
semicolon



     |this id equal_mark new id parentheses_l parentheses_r semicolon

     |this id equal_mark new id parentheses_l STATE_PARAM_OBJECT
parentheses_r semicolon


     //CUANDO ES UN ARREGLO
     |this id equal_mark VALUE_ARRAY_STATE semicolon
     |this id equal_mark new DATATYPE_PRIMITIVE
STRUCT_VALUE_DIMS_VAR_ARRAY semicolon

     |this id equal_mark new id STRUCT_VALUE_DIMS_VAR_ARRAY semicolon


     |error equal_mark new id parentheses_l STATE_PARAM_OBJECT
parentheses_r semicolon
```

```
     |this id equal_mark error parentheses_l STATE_PARAM_OBJECT
parentheses_r semicolon

  ;

  STRUCT_VAR
     :var id equal_mark ASIGNATION_VAR semicolon

     |final var id equal_mark ASIGNATION_VAR semicolon


     |var id equal_mark new id parentheses_l parentheses_r semicolon

     |final var id equal_mark new id parentheses_l parentheses_r
semicolon

     |var id equal_mark new id parentheses_l STATE_PARAM_OBJECT
parentheses_r semicolon

     |final var id equal_mark new id parentheses_l STATE_PARAM_OBJECT
parentheses_r semicolon


     // VAR = ARREGLOS
     |var id equal_mark new DATATYPE_PRIMITIVE
STRUCT_VALUE_DIMS_VAR_ARRAY semicolon

     |final var id equal_mark new DATATYPE_PRIMITIVE
STRUCT_VALUE_DIMS_VAR_ARRAY semicolon


     |var id equal_mark new id STRUCT_VALUE_DIMS_VAR_ARRAY semicolon

     |final var id equal_mark new id STRUCT_VALUE_DIMS_VAR_ARRAY
semicolon
```

```
     |var error new id parentheses_l STATE_PARAM_OBJECT parentheses_r
semicolon
     |var id equal_mark error parentheses_l STATE_PARAM_OBJECT
parentheses_r semicolon
     |var error semicolon
  ;

  //ARREGLOS
  STATE_DECLARATION_VAR_ARRAY
     :STRUCT_DECLARATION_VAR_ARRAY semicolon

  ;

  STRUCT_DECLARATION_VAR_ARRAY
     :STRUCT_DECLARATION_VAR_ARRAY comma STRUCT_EMPTY_DIMS_VAR_ARRAY id
STATE_ASIGNATION_VAR_ARRAY

     |final DATATYPE_PRIMITIVE STRUCT_EMPTY_DIMS_VAR_ARRAY id
STATE_ASIGNATION_VAR_ARRAY

     |DATATYPE_PRIMITIVE STRUCT_EMPTY_DIMS_VAR_ARRAY id
STATE_ASIGNATION_VAR_ARRAY


     |error STRUCT_EMPTY_DIMS_VAR_ARRAY id STATE_ASIGNATION_VAR_ARRAY
     |DATATYPE_PRIMITIVE error id STATE_ASIGNATION_VAR_ARRAY
  ;

  STRUCT_EMPTY_DIMS_VAR_ARRAY
     :STRUCT_EMPTY_DIMS_VAR_ARRAY brackets_l brackets_r
     |brackets_l brackets_r
  ;

  STRUCT_VALUE_DIMS_VAR_ARRAY
     :STRUCT_VALUE_DIMS_VAR_ARRAY brackets_l STATE_VALUE brackets_r
     |brackets_l STATE_VALUE brackets_r
  ;

  STATE_ASIGNATION_VAR_ARRAY
     :equal_mark ASIGNATION_VAR_ARRAY
     |
  ;
```

```
  ASIGNATION_VAR_ARRAY
     :STATE_VALUE
     |VALUE_ARRAY_STATE
     |new DATATYPE_PRIMITIVE STRUCT_VALUE_DIMS_VAR_ARRAY


     |error STRUCT_VALUE_DIMS_VAR_ARRAY
  ;

  VALUE_ARRAY_STATE
     :keys_l VALUE_ARRAY_MULTI_STATE keys_r
     |keys_l VALUE_UNIT_ARRAY_STATE keys_r
     |keys_l keys_r
  ;

  VALUE_ARRAY_MULTI_STATE
     :VALUE_ARRAY_MULTI_STATE comma keys_l VALUE_ARRAY_MULTI_STATE
keys_r
     |VALUE_ARRAY_MULTI_STATE comma keys_l VALUE_UNIT_ARRAY_STATE
keys_r
     |keys_l VALUE_ARRAY_MULTI_STATE keys_r
     |keys_l VALUE_UNIT_ARRAY_STATE keys_r
  ;

  VALUE_UNIT_ARRAY_STATE
     :VALUE_UNIT_ARRAY_STATE comma STATE_VALUE
     |VALUE_UNIT_ARRAY_STATE comma new DATATYPE_PRIMITIVE
STRUCT_VALUE_DIMS_VAR_ARRAY

     |VALUE_UNIT_ARRAY_STATE comma new id STRUCT_VALUE_DIMS_VAR_ARRAY

     |STATE_VALUE
     |new DATATYPE_PRIMITIVE STRUCT_VALUE_DIMS_VAR_ARRAY
     |new id STRUCT_VALUE_DIMS_VAR_ARRAY
  ;

  STRUCT_ASIGNATION_VAR_ARRAY
     :id STRUCT_VALUE_DIMS_VAR_ARRAY equal_mark ASIGNATION_VAR
semicolon

     |id STRUCT_VALUE_DIMS_VAR_ARRAY equal_mark new id parentheses_l
parentheses_r semicolon
```

```
     |id STRUCT_VALUE_DIMS_VAR_ARRAY equal_mark new id parentheses_l
STATE_PARAM_OBJECT parentheses_r semicolon

     //CUANDO SON ATRIBUTOS
     |this id STRUCT_VALUE_DIMS_VAR_ARRAY equal_mark ASIGNATION_VAR
semicolon

     |this id STRUCT_VALUE_DIMS_VAR_ARRAY equal_mark new id
parentheses_l parentheses_r semicolon

     |this id STRUCT_VALUE_DIMS_VAR_ARRAY equal_mark new id
parentheses_l STATE_PARAM_OBJECT parentheses_r semicolon


     |this id error equal_mark new id parentheses_l STATE_PARAM_OBJECT
parentheses_r semicolon
     |this id STRUCT_VALUE_DIMS_VAR_ARRAY error parentheses_l
STATE_PARAM_OBJECT parentheses_r semicolon
     |error STRUCT_VALUE_DIMS_VAR_ARRAY equal_mark new id parentheses_l
STATE_PARAM_OBJECT parentheses_r semicolon
  ;


  STATE_DECLARATION_OBJECT_VAR
     :STRUCT_DECLARATION_OBJECT_VAR semicolon

  ;

  STATE_DECLARATION_OBJECT_ATRIB
     :STRUCT_DECLARATION_OBJECT_ATRIB semicolon

     |getter setter STRUCT_DECLARATION_OBJECT_ATRIB semicolon

     |setter getter STRUCT_DECLARATION_OBJECT_ATRIB semicolon

     |getter STRUCT_DECLARATION_OBJECT_ATRIB semicolon

     |setter STRUCT_DECLARATION_OBJECT_ATRIB semicolon


     |private STRUCT_DECLARATION_OBJECT_ATRIB semicolon
```

```
    |getter setter private STRUCT_DECLARATION_OBJECT_ATRIB semicolon

    |setter getter private STRUCT_DECLARATION_OBJECT_ATRIB semicolon

    |getter private STRUCT_DECLARATION_OBJECT_ATRIB semicolon

    |setter private STRUCT_DECLARATION_OBJECT_ATRIB semicolon


    |public STRUCT_DECLARATION_OBJECT_ATRIB semicolon

    |getter setter public STRUCT_DECLARATION_OBJECT_ATRIB semicolon

    |setter getter public STRUCT_DECLARATION_OBJECT_ATRIB semicolon

    |getter public STRUCT_DECLARATION_OBJECT_ATRIB semicolon

    |setter public STRUCT_DECLARATION_OBJECT_ATRIB semicolon


    |error STRUCT_DECLARATION_OBJECT_ATRIB semicolon
;

STRUCT_DECLARATION_OBJECT_ATRIB
    :STRUCT_DECLARATION_OBJECT_ATRIB comma id STATE_ASIGNATION_OBJECT

    |static final id id STATE_ASIGNATION_OBJECT

    |final static id id STATE_ASIGNATION_OBJECT

    |final id id STATE_ASIGNATION_OBJECT

    |static id id STATE_ASIGNATION_OBJECT

    |id id STATE_ASIGNATION_OBJECT


    |id error STATE_ASIGNATION_OBJECT
;

STRUCT_DECLARATION_OBJECT_VAR
    :STRUCT_DECLARATION_OBJECT_VAR comma id STATE_ASIGNATION_OBJECT
```

```
    |final id id STATE_ASIGNATION_OBJECT

    |id id STATE_ASIGNATION_OBJECT



    |id error STATE_ASIGNATION_OBJECT
  ;

  STATE_ASIGNATION_OBJECT
    :equal_mark VALUE_ASIGNATION_OBJECT
    |

    |error VALUE_ASIGNATION_OBJECT
  ;

  VALUE_ASIGNATION_OBJECT
    :STATE_VALUE
    |new id parentheses_l STATE_PARAM_OBJECT parentheses_r
    |new id parentheses_l parentheses_r

    |error parentheses_l STATE_PARAM_OBJECT parentheses_r
  ;

  STATE_PARAM_OBJECT
    :STATE_PARAM_OBJECT comma STATE_VALUE
    |STATE_PARAM_OBJECT comma new id parentheses_l STATE_PARAM_OBJECT
parentheses_r

    |STATE_PARAM_OBJECT comma new id parentheses_l parentheses_r

    |STATE_PARAM_OBJECT comma new DATATYPE_PRIMITIVE
STRUCT_VALUE_DIMS_VAR_ARRAY

    |STATE_PARAM_OBJECT comma new id STRUCT_VALUE_DIMS_VAR_ARRAY



    |STATE_VALUE
    |new id parentheses_l STATE_PARAM_OBJECT parentheses_r
    |new id parentheses_l parentheses_r
    |new DATATYPE_PRIMITIVE STRUCT_VALUE_DIMS_VAR_ARRAY

    |new id STRUCT_VALUE_DIMS_VAR_ARRAY
```

```
    |STATE_PARAM_OBJECT error STATE_VALUE
  ;


  STATE_DECLARATION_OBJECT_ATRIB_ARRAY
    :STRUCT_DECLARATION_OBJECT_ATRIB_ARRAY semicolon

    |getter STRUCT_DECLARATION_OBJECT_ATRIB_ARRAY semicolon

    |setter STRUCT_DECLARATION_OBJECT_ATRIB_ARRAY semicolon

    |getter setter STRUCT_DECLARATION_OBJECT_ATRIB_ARRAY semicolon

    |setter getter STRUCT_DECLARATION_OBJECT_ATRIB_ARRAY semicolon


    |private STRUCT_DECLARATION_OBJECT_ATRIB_ARRAY semicolon

    |getter private STRUCT_DECLARATION_OBJECT_ATRIB_ARRAY semicolon

    |setter private STRUCT_DECLARATION_OBJECT_ATRIB_ARRAY semicolon

    |getter setter private STRUCT_DECLARATION_OBJECT_ATRIB_ARRAY
semicolon

    |setter getter private STRUCT_DECLARATION_OBJECT_ATRIB_ARRAY
semicolon


    |public STRUCT_DECLARATION_OBJECT_ATRIB_ARRAY semicolon

    |getter public STRUCT_DECLARATION_OBJECT_ATRIB_ARRAY semicolon

    |setter public STRUCT_DECLARATION_OBJECT_ATRIB_ARRAY semicolon

    |getter setter public STRUCT_DECLARATION_OBJECT_ATRIB_ARRAY
semicolon

    |setter getter public STRUCT_DECLARATION_OBJECT_ATRIB_ARRAY
semicolon
```

```
     |error public STRUCT_DECLARATION_OBJECT_ATRIB_ARRAY semicolon
     |error STRUCT_DECLARATION_OBJECT_ATRIB_ARRAY semicolon
  ;

  STATE_DECLARATION_OBJECT_VAR_ARRAY
     :STRUCT_DECLARATION_OBJECT_VAR_ARRAY semicolon

  ;

  STRUCT_DECLARATION_OBJECT_ATRIB_ARRAY
     :STRUCT_DECLARATION_OBJECT_ATRIB_ARRAY comma
STRUCT_EMPTY_DIMS_VAR_ARRAY id STATE_ASIGNATION_OBJECT_VAR_ARRAY

     |final static id STRUCT_EMPTY_DIMS_VAR_ARRAY id
STATE_ASIGNATION_OBJECT_VAR_ARRAY

     |static final id STRUCT_EMPTY_DIMS_VAR_ARRAY id
STATE_ASIGNATION_OBJECT_VAR_ARRAY

     |final id STRUCT_EMPTY_DIMS_VAR_ARRAY id
STATE_ASIGNATION_OBJECT_VAR_ARRAY

     |static id STRUCT_EMPTY_DIMS_VAR_ARRAY id
STATE_ASIGNATION_OBJECT_VAR_ARRAY

     |id STRUCT_EMPTY_DIMS_VAR_ARRAY id
STATE_ASIGNATION_OBJECT_VAR_ARRAY


     |id error id STATE_ASIGNATION_OBJECT_VAR_ARRAY
     |id STRUCT_EMPTY_DIMS_VAR_ARRAY error
STATE_ASIGNATION_OBJECT_VAR_ARRAY
  ;

  STRUCT_DECLARATION_OBJECT_VAR_ARRAY
     :STRUCT_DECLARATION_OBJECT_VAR_ARRAY comma
STRUCT_EMPTY_DIMS_VAR_ARRAY id STATE_ASIGNATION_OBJECT_VAR_ARRAY

     |final id STRUCT_EMPTY_DIMS_VAR_ARRAY id
STATE_ASIGNATION_OBJECT_VAR_ARRAY
```

```
     |id STRUCT_EMPTY_DIMS_VAR_ARRAY id
STATE_ASIGNATION_OBJECT_VAR_ARRAY



     |final error id STATE_ASIGNATION_OBJECT_VAR_ARRAY
     |id STRUCT_EMPTY_DIMS_VAR_ARRAY error
STATE_ASIGNATION_OBJECT_VAR_ARRAY
  ;

  STATE_ASIGNATION_OBJECT_VAR_ARRAY
     :equal_mark ASIGNATION_OBJECT_VAR_ARRAY
     |

     |error ASIGNATION_OBJECT_VAR_ARRAY
  ;

  ASIGNATION_OBJECT_VAR_ARRAY
     :STATE_VALUE
     |VALUE_ARRAY_STATE
     |new id STRUCT_VALUE_DIMS_VAR_ARRAY


     |error STRUCT_VALUE_DIMS_VAR_ARRAY
  ;



  STATE_COND_IF_ELSEIF_ELSE
     :COND_IF_STATE STATE_ELSE
  ;

  COND_IF_STATE
     :STRUCT_IF
     |STRUCT_IF STATE_ELSEIF
  ;

  STATE_ELSEIF
     :STATE_ELSEIF STRUCT_ELSEIF
     |STRUCT_ELSEIF
  ;

  STATE_ELSE
     :STRUCT_ELSE
```

```
    |
  ;

  STRUCT_IF
    :if parentheses_l STATE_VALUE parentheses_r keys_l CODE_FUNC_METOD
keys_r


    |error STATE_VALUE parentheses_r keys_l CODE_FUNC_METOD keys_r
    |if error keys_l CODE_FUNC_METOD keys_r
  ;

  STRUCT_ELSEIF
    :elseif parentheses_l STATE_VALUE parentheses_r keys_l
CODE_FUNC_METOD keys_r


    |elseif error keys_l CODE_FUNC_METOD keys_r
  ;

  STRUCT_ELSE
    :else keys_l CODE_FUNC_METOD keys_r
  ;



  STATE_WHILE
    :STRUCT_WHILE
  ;

  STRUCT_WHILE
    :while parentheses_l STATE_VALUE parentheses_r keys_l
CODE_FUNC_METOD keys_r


    |while error keys_l CODE_FUNC_METOD keys_r
  ;

  STATE_DO_WHILE
    :STRUCT_DO_WHILE
  ;

  STRUCT_DO_WHILE
```

```
     :do keys_l CODE_FUNC_METOD keys_r while parentheses_l STATE_VALUE
parentheses_r semicolon


     |do keys_l CODE_FUNC_METOD keys_r while error semicolon
  ;

  STATE_FOR
     :STRUCT_FOR
  ;

  STRUCT_FOR
     :for parentheses_l ASIG_STATE_FOR semicolon COND_STATE_FOR
semicolon SENTENCE_STATE_FOR parentheses_r keys_l CODE_FUNC_METOD
keys_r


     |error parentheses_l ASIG_STATE_FOR semicolon COND_STATE_FOR
semicolon SENTENCE_STATE_FOR parentheses_r keys_l CODE_FUNC_METOD
keys_r
  ;

  ASIG_STATE_FOR
     :DATATYPE_PRIMITIVE id equal_mark STATE_VALUE

     |id equal_mark STATE_VALUE
     |var id equal_mark STATE_VALUE
     |this id equal_mark STATE_VALUE

     |error id equal_mark STATE_VALUE
     |error STATE_VALUE
     |var error STATE_VALUE
     |this error STATE_VALUE
  ;

  COND_STATE_FOR
     :STATE_VALUE
  ;

  SENTENCE_STATE_FOR
     :id equal_mark ASIGNATION_VAR
     |id plus_plus
```

```
    |id minus_minus

    //Cuando es un objeto
    |id period id equal_mark ASIGNATION_VAR

    //CUANDO ES UN ARREGLO
    |id equal_mark VALUE_ARRAY_STATE
    //PARA LOS TRIBUTOS
    |this id equal_mark ASIGNATION_VAR
    |this id plus_plus

    |this id minus_minus

    //Cuando es un objeto
    |this id period id equal_mark ASIGNATION_VAR
    //CUANDO ES UN ARREGLO
    |this id equal_mark VALUE_ARRAY_STATE

    |error ASIGNATION_VAR
    |error plus_plus
    |error minus_minus

  ;



  STATE_SWITCH
    :STRUCT_SWITCH
  ;

  STRUCT_SWITCH
    :switch parentheses_l STATE_VALUE parentheses_r keys_l
CONTENT_SWITCH keys_r


    |switch error keys_l CONTENT_SWITCH keys_r
    |switch parentheses_l STATE_VALUE parentheses_r keys_l error
keys_r
  ;

  CONTENT_SWITCH
    :STRUCT_CASE
    |STRUCT_CASE default colon CODE_FUNC_METOD
```

```
    |error default colon CODE_FUNC_METOD
  ;

  STRUCT_CASE
    :STRUCT_CASE case VALUE_CASE colon CODE_FUNC_METOD

    |case VALUE_CASE colon CODE_FUNC_METOD


    |case error colon CODE_FUNC_METOD
    |error VALUE_CASE colon CODE_FUNC_METOD
  ;

  VALUE_CASE
    :decimal_primitive
    |integer_primitive
    |char_primitive
    |string_primitive
    |true
    |false
  ;



  STATE_CONSTRUCTOR
    :id parentheses_l parentheses_r keys_l CODE_CONSTRUCT keys_r

    |id parentheses_l PARAMS_FUNC_METOD parentheses_r keys_l
CODE_CONSTRUCT keys_r

    |public id parentheses_l parentheses_r keys_l CODE_CONSTRUCT
keys_r

    |public id parentheses_l PARAMS_FUNC_METOD parentheses_r keys_l
CODE_CONSTRUCT keys_r


    |error id parentheses_l PARAMS_FUNC_METOD parentheses_r keys_l
CODE_CONSTRUCT keys_r
    |public id error keys_l CODE_CONSTRUCT keys_r
  ;
```

```
  STATE_SUPER
     :super parentheses_l parentheses_r semicolon
     |super parentheses_l STATE_PARAM_CALL_FUNCTION parentheses_r
semicolon

     |super error semicolon
  ;

  CODE_CONSTRUCT
     :CODE_CONSTRUCT STATE_DECLARATION_VAR
     |CODE_CONSTRUCT STATE_DECLARATION_VAR_ARRAY
     |CODE_CONSTRUCT STATE_DECLARATION_OBJECT_VAR
     |CODE_CONSTRUCT STATE_DECLARATION_OBJECT_VAR_ARRAY
     |CODE_CONSTRUCT STRUCT_ASIGNATION_VAR
     |CODE_CONSTRUCT STRUCT_ASIGNATION_VAR_ARRAY
     |CODE_CONSTRUCT STATE_COMMENT
     |CODE_CONSTRUCT STRUCT_VAR
     |CODE_CONSTRUCT STATE_CALL_FUNCTION
     |CODE_CONSTRUCT STATE_COND_IF_ELSEIF_ELSE
     |CODE_CONSTRUCT STATE_SWITCH
     |CODE_CONSTRUCT STATE_FOR
     |CODE_CONSTRUCT STATE_WHILE
     |CODE_CONSTRUCT STATE_DO_WHILE
     |CODE_CONSTRUCT STATE_MATH
     |CODE_CONSTRUCT STATE_BREAK
     |CODE_CONSTRUCT STATE_CONTINUE
     |CODE_CONSTRUCT STATE_PRINTS
     |CODE_CONSTRUCT STRUCT_INPUT
     |CODE_CONSTRUCT STATE_RETURN
     |CODE_CONSTRUCT STATE_TOSTRING
     |CODE_CONSTRUCT STATE_SUPER
     |
  ;

  STATE_CALL_FUNCTION
     :STRUCT_CALL_FUNCTION semicolon
  ;

  STRUCT_CALL_FUNCTION
     :id parentheses_l parentheses_r

     |id parentheses_l STATE_PARAM_CALL_FUNCTION parentheses_r
```

```
     |this id parentheses_l parentheses_r

     |this id parentheses_l STATE_PARAM_CALL_FUNCTION parentheses_r


     //Para funciones de objetos
     |id period id parentheses_l parentheses_r

     |id period id parentheses_l STATE_PARAM_CALL_FUNCTION
parentheses_r

     |this id period id parentheses_l parentheses_r

     |this id period id parentheses_l STATE_PARAM_CALL_FUNCTION
parentheses_r


     |error period id parentheses_l STATE_PARAM_CALL_FUNCTION
parentheses_r

   ;

   STATE_PARAM_CALL_FUNCTION
      :STATE_PARAM_CALL_FUNCTION comma STATE_VALUE
      |STATE_PARAM_CALL_FUNCTION comma new id parentheses_l
STATE_PARAM_CALL_FUNCTION parentheses_r

      |STATE_PARAM_CALL_FUNCTION comma new id parentheses_l
parentheses_r


      |STATE_PARAM_CALL_FUNCTION comma new DATATYPE_PRIMITIVE
STRUCT_VALUE_DIMS_VAR_ARRAY

      |STATE_PARAM_CALL_FUNCTION comma new id
STRUCT_VALUE_DIMS_VAR_ARRAY


      |STATE_VALUE
      |new id parentheses_l STATE_PARAM_CALL_FUNCTION parentheses_r
      |new id parentheses_l parentheses_r
      |VALUE_ARRAY_STATE
```

```
    |new DATATYPE_PRIMITIVE STRUCT_VALUE_DIMS_VAR_ARRAY

    |new id STRUCT_VALUE_DIMS_VAR_ARRAY


  ;


  STATE_FUNCTION
    :STRUCT_FUNCTION

    |override STRUCT_FUNCTION


    |public STRUCT_FUNCTION

    |override public STRUCT_FUNCTION


    |private STRUCT_FUNCTION
    |override private STRUCT_FUNCTION


    |error private STRUCT_FUNCTION
    |error public STRUCT_FUNCTION
    |error STRUCT_FUNCTION
  ;

  STRUCT_FUNCTION
    :DATATYPE_PRIMITIVE id parentheses_l parentheses_r keys_l
CODE_FUNC_METOD keys_r

    |DATATYPE_PRIMITIVE id parentheses_l PARAMS_FUNC_METOD
parentheses_r keys_l CODE_FUNC_METOD keys_r

    |static DATATYPE_PRIMITIVE id parentheses_l parentheses_r keys_l
CODE_FUNC_METOD keys_r

    |static DATATYPE_PRIMITIVE id parentheses_l PARAMS_FUNC_METOD
parentheses_r keys_l CODE_FUNC_METOD keys_r
```

```
     |error parentheses_l PARAMS_FUNC_METOD parentheses_r keys_l
CODE_FUNC_METOD keys_r
     |DATATYPE_PRIMITIVE id error keys_l CODE_FUNC_METOD keys_r
     |static DATATYPE_PRIMITIVE id error keys_l CODE_FUNC_METOD keys_r
  ;


  PARAMS_FUNC_METOD
     :PARAMS_FUNC_METOD comma DATATYPE_PRIMITIVE id

     |PARAMS_FUNC_METOD comma id id

     |PARAMS_FUNC_METOD comma DATATYPE_PRIMITIVE
STRUCT_EMPTY_DIMS_VAR_ARRAY id

     |PARAMS_FUNC_METOD comma id STRUCT_EMPTY_DIMS_VAR_ARRAY id

     |DATATYPE_PRIMITIVE id
     |id id
     |DATATYPE_PRIMITIVE STRUCT_EMPTY_DIMS_VAR_ARRAY id
     |id STRUCT_EMPTY_DIMS_VAR_ARRAY id
  ;


  STATE_METOD
     :STRUCT_METOD

     |override STRUCT_METOD


     |public STRUCT_METOD

     |override public STRUCT_METOD


     |private STRUCT_METOD

     |override private STRUCT_METOD

  ;

  STRUCT_METOD
     :void id parentheses_l parentheses_r keys_l CODE_FUNC_METOD keys_r
```

```
    |void id parentheses_l PARAMS_FUNC_METOD parentheses_r keys_l
CODE_FUNC_METOD keys_r

    |static void id parentheses_l parentheses_r keys_l CODE_FUNC_METOD
keys_r

    |static void id parentheses_l PARAMS_FUNC_METOD parentheses_r
keys_l CODE_FUNC_METOD keys_r


    |void id error keys_l CODE_FUNC_METOD keys_r
    |static void id error keys_l CODE_FUNC_METOD keys_r
  ;


  CODE_FUNC_METOD
    :CODE_FUNC_METOD STATE_DECLARATION_VAR
    |CODE_FUNC_METOD STATE_DECLARATION_VAR_ARRAY
    |CODE_FUNC_METOD STATE_DECLARATION_OBJECT_VAR
    |CODE_FUNC_METOD STATE_DECLARATION_OBJECT_VAR_ARRAY
    |CODE_FUNC_METOD STRUCT_ASIGNATION_VAR
    |CODE_FUNC_METOD STRUCT_ASIGNATION_VAR_ARRAY
    |CODE_FUNC_METOD STATE_COMMENT
    |CODE_FUNC_METOD STRUCT_VAR
    |CODE_FUNC_METOD STATE_CALL_FUNCTION
    |CODE_FUNC_METOD STATE_COND_IF_ELSEIF_ELSE
    |CODE_FUNC_METOD STATE_SWITCH
    |CODE_FUNC_METOD STATE_FOR
    |CODE_FUNC_METOD STATE_WHILE
    |CODE_FUNC_METOD STATE_DO_WHILE
    |CODE_FUNC_METOD STATE_MATH
    |CODE_FUNC_METOD STATE_BREAK
    |CODE_FUNC_METOD STATE_CONTINUE
    |CODE_FUNC_METOD STATE_PRINTS
    |CODE_FUNC_METOD STRUCT_INPUT
    |CODE_FUNC_METOD STATE_RETURN
    |CODE_FUNC_METOD STATE_TOSTRING
    |
  ;


  STATE_MATH
```

```
    :STRUCT_CALL_FUNC_MATH semicolon

    |error semicolon
  ;

  STRUCT_CALL_FUNC_MATH
    // Math.abs(double a)
    :math_abs parentheses_l STATE_VALUE parentheses_r
    // Math.ceil(double a)
    |math_ceil parentheses_l STATE_VALUE parentheses_r
    // Math.floor(double a)
    |math_floor parentheses_l STATE_VALUE parentheses_r
    // Math.round(double a)
    |math_round parentheses_l STATE_VALUE parentheses_r
    // Math.max(double a, double b)
    |math_max parentheses_l STATE_VALUE comma STATE_VALUE
parentheses_r
    // Math.min(double a, double b)
    |math_min parentheses_l STATE_VALUE comma STATE_VALUE
parentheses_r
    // Math.pow(double base, double exponente)
    |math_pow parentheses_l STATE_VALUE comma STATE_VALUE
parentheses_r
    // Math.sqrt(double a)
    |math_sqrt parentheses_l STATE_VALUE parentheses_r
    // Math.random()
    |math_random parentheses_l parentheses_r
    // Math.toRadians(double grados)
    |math_toradians parentheses_l STATE_VALUE parentheses_r
    // Math.acos(double a)
    |math_acos parentheses_l STATE_VALUE parentheses_r
    // Math.sin(double a)
    |math_sin parentheses_l STATE_VALUE parentheses_r
    // Math.atan(double a)
    |math_atan parentheses_l STATE_VALUE parentheses_r
    // Math.exp(double a)
    |math_exp parentheses_l STATE_VALUE parentheses_r
  ;




  STATE_BREAK
```

```
    :break semicolon
;


STATE_CONTINUE
    :continue semicolon
;

STATE_RETURN
    :return STATE_VALUE semicolon
;

STRUCT_CALL_ARRAY
    :id STRUCT_VALUE_DIMS_VAR_ARRAY
    |this id STRUCT_VALUE_DIMS_VAR_ARRAY
;

STRUCT_CALL_OBJECT_VALUE
    :id period id
    |this id period id

    |error period id
;

STATE_INPUTS
    :STRUCT_INPUT semicolon
;

STRUCT_INPUT
    :readfloat parentheses_l id parentheses_r
    |readint parentheses_l id parentheses_r
    |readchar parentheses_l id parentheses_r
    |readboolean parentheses_l id parentheses_r
    |readstring parentheses_l id parentheses_r
;

STATE_PRINTS
    :STRUCT_SOUT semicolon
;

STRUCT_SOUT
    :printf parentheses_l STATE_VALUE parentheses_r
    |println parentheses_l STATE_VALUE parentheses_r
```

```
    |printf parentheses_l parentheses_r
    |println parentheses_l parentheses_r

    |println error parentheses_r
;

STATE_TOSTRING
    :STRUCT_TOSTRING semicolon
;

STRUCT_TOSTRING
    :tostring parentheses_l parentheses_r
    |this tostring parentheses_l parentheses_r
    |id period tostring parentheses_l parentheses_r
    |this id period tostring parentheses_l parentheses_r

    |error tostring parentheses_l parentheses_r
    |tostring error
    |this tostring error
    |id period tostring error
    |this id period tostring error
;
```