SER502 PROJECT IJAR PROGRAMMING LANGUAGE

TEAM 13

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OUTLINE

- Introduction
- Syntax and Grammar
- Lexical analysis and Parser
- Intermediate Code Generator
- Runtime

INTRODUCTION

- Language name: IJAR Programming Language
- Tools:
  - Compiler: INTELLIJ IDEA and ANTLR4
  - Runtime: Java 8
- Basic Features:
  - Supports data types- Boolean, int, string
  - Supports conditional statements and loop structures like-
    - If condition
    - For loop
    - While loop
  - Prints output on console

BASIC FEATURES CONTD

- Supports basic expressions like-
  - Arithmetic (+, -, /, *, %, ^)
  - Logical (&&, ||, !!)
  - Comparison (<, <=, >, >=, ==, !=)
  - Assignment (=)
  - Ternary (?, :)

SYNTAX

- If condition

```
If(x<5)
{
        x = x + 7;
}
else
{
        x = x – 7;
}
```

- While condition

```
while(x<5)
{
        x = x + 1;
}
```

SYNTAX

- For loop

```
for (i=0; i<10; i=i+1)
{
        num = i + 3;
}
```

- For loop

```
for i in range(0,10)
{
        num = i + 3;
}
```

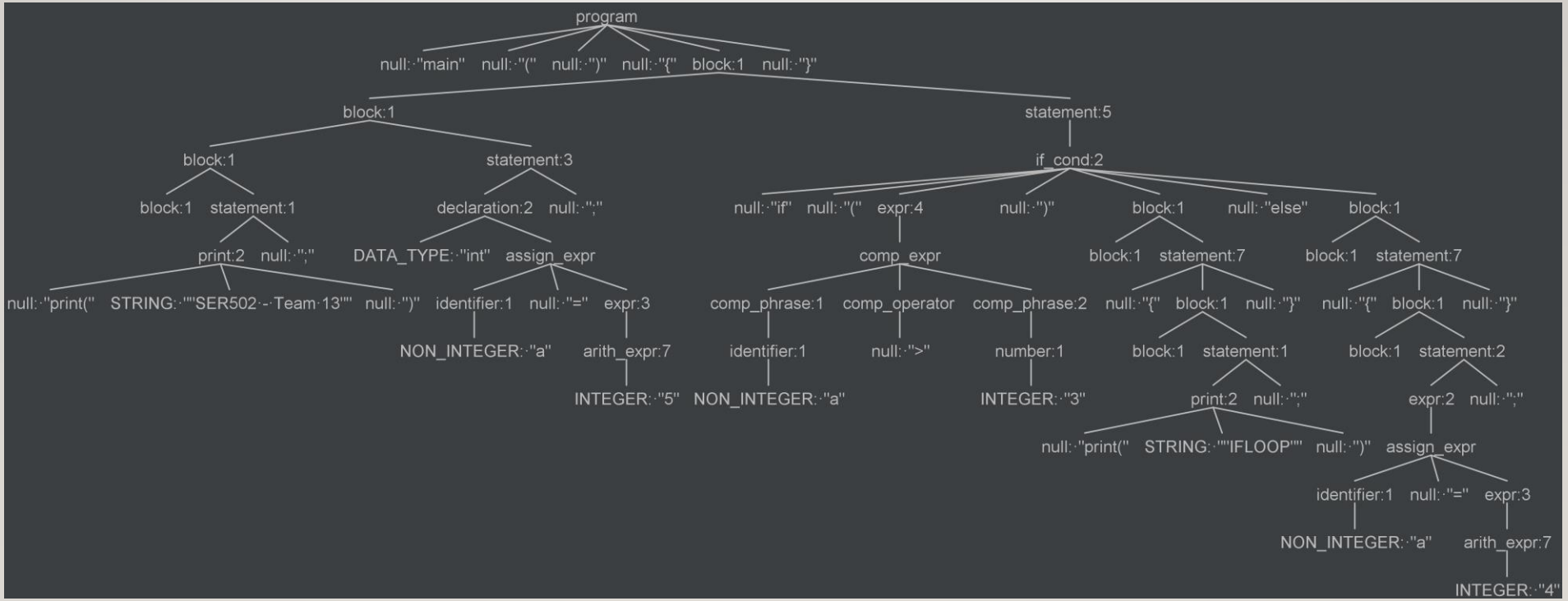
SYNTAX

```
main()
{
   print("SER502 - Team 13");
   int a = 5;
   if(a > 3){
   print(“IFLOOP");
}
   else
   {
      a = 4;
   }
}
```

INTERMEDIATE CODE FORMAT

```
PROGRAM
PRINT SER502 - TEAM 13
LOAD a
ASSIGN 5
IF
COMP a 3
PRINT
END IF
ELSE
ASSIGN a 4
END ELSE
END PROGRAM
```

PARSE TREE


program
null:·"main" null:·"(" null:·")" null:·"{" block:1 null:·"}"
block:1
statement:5
block:1
statement:3
if_cond:2
block:1 statement:1
declaration:2 null:·";"
null:·"if" null:·"(" expr:4 null:·")" block:1 null:·"else" block:1
print:2 null:·";"
DATA_TYPE:·"int" assign_expr
comp_expr
block:1 statement:7
block:1 statement:7
null:·"print(" STRING:·""SER502·-·Team·13"" null:·")" identifier:1 null:·"=" expr:3
comp_phrase:1 comp_operator comp_phrase:2
null:·"{" block:1 null:·"}"
null:·"{" block:1 null:·"}"
NON_INTEGER:·"a" arith_expr:7
identifier:1 null:·">" number:1
block:1 statement:1
block:1 statement:2
INTEGER:·"5" NON_INTEGER:·"a" INTEGER:·"3"
print:2 null:·";"
expr:2 null:·";"
null:·"print(" STRING:·""IFLOOP"" null:·")" assign_expr
identifier:1 null:·"=" expr:3
NON_INTEGER:·"a" arith_expr:7
INTEGER:·"4"

STACK:

- We have used stack for :
  - Storing temporary variables
  - Combining program – program_end, if-endif, else-end_else, etc
  - As a data storage for the runtime file.

PROCEDURE

- First, we generated a grammar file.
- Then using ANTLR we auto-generated a lexer and parser.
- The parse tree is generated by the parser.
- By traversing the parse tree, we created the intermediate code.
- The "IJARPLListener.java" is used for traversal.
- The Antlr will generate two functions "enter " and "exit" for every non-terminal in the grammar.
- "enter" is called on the beginning of the node while "exit" is called after everything in the node is visited.

PROCEDURE

- Once, the Listener file is configured, a similar configuration is done for the intermediate code generator.
- Here, an array list is created named "codeGen" is created. Symbols from "IJARPLSymbol" are used and added to the array list based on the code used.
- This array list is the accessed and all the values printed to generate the intermediate code. The file "IJARPLIntermediateCodeGenerator" takes care of this part.

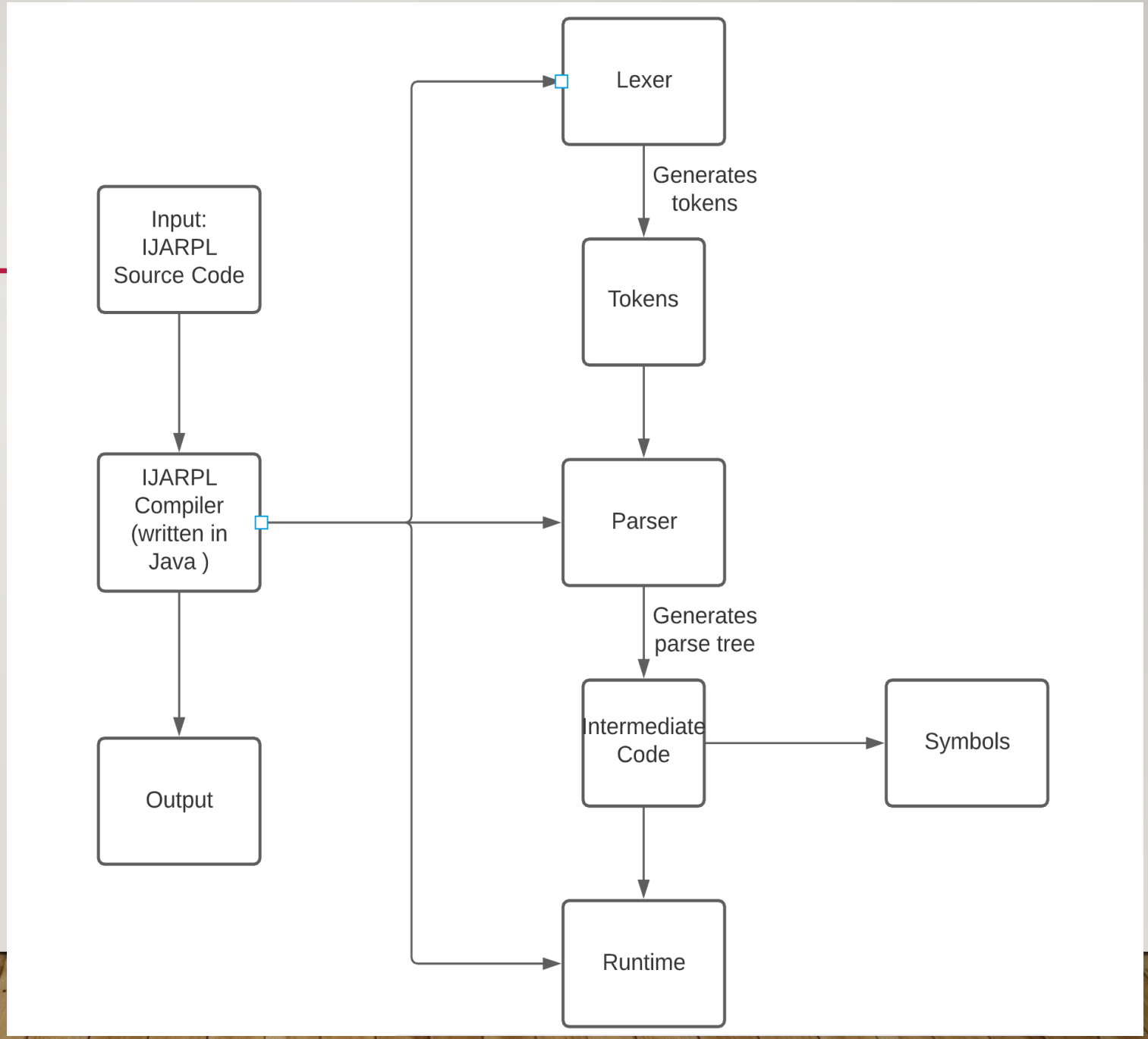
PROCEDURE

- The arraylist from the intermediate code generator is then written down in a .txt file.
- The .txt file is then passed on to the execution file called "IJARPLRuntime".
- The execution files uses two separate stacks to handle strings and numerals.
- The stacks will be iterated to convert the intermediate code to java code.
- Any errors in runtime will be displayed on the console.

PROCEDURE

- The compiler is the main function which works as a controller between all the other files.
- It will get the ".IJARPL" file.
- It will send it to a lexer, get the tokens, pass the tokens to the parser, get the parse tree and then pass the tree to get intermediate code.
- Which will then be sent to executor using compiler.
- In the end the output is given by the compiler.

ARCHITECTURE



THANK YOU!