Improved String Support

Improve string support for the Amy compiler

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Plan

1. Introduction
2. Overview of the added features
3. What? Why? Where? How? And examples!
4. Future improvements
5. Conclusion

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Summary

- Types
  - Char
- Built-in functions
  - StringImpl
    - substring(input: String, start: Int(32), end: Int(32)): String
    - length(input: String): Int(32)
    - replace(input: : String, c1: Char, c2: Char): String
    - strip(input: String): String
    - toLowerCase(input: String): String — toUpperCase(input: String): String
    - startsWith(input: String, search: String): Boolean — endsWith(input: String, search: String): Boolean
    - indexOf(input: String, search: Char): Int(32)
    - charAt(input: String: index: Int(32)): Char
    - split(input: String, separator: Char): List[String]
    - toCharArray(input: String): List[Char]
  - Std
    - printChar(input: Char): Unit
    - charToString(input: Char): String

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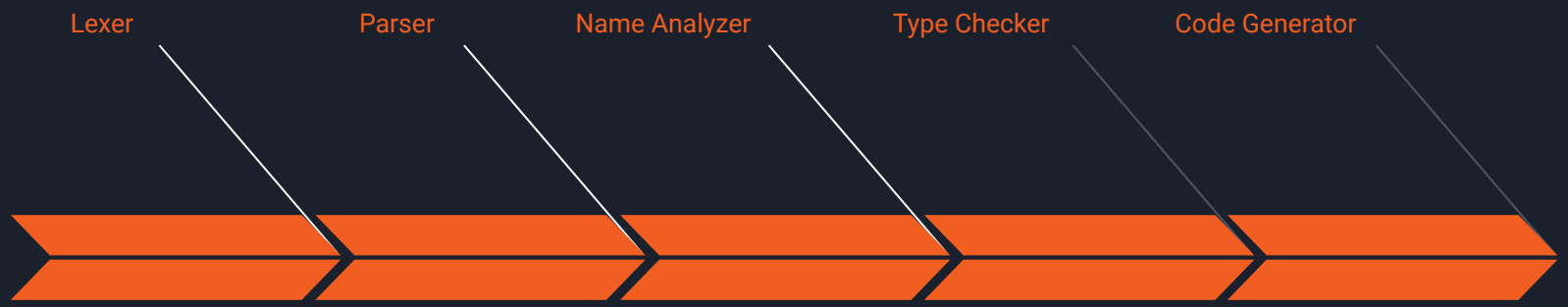
Added Type — Char

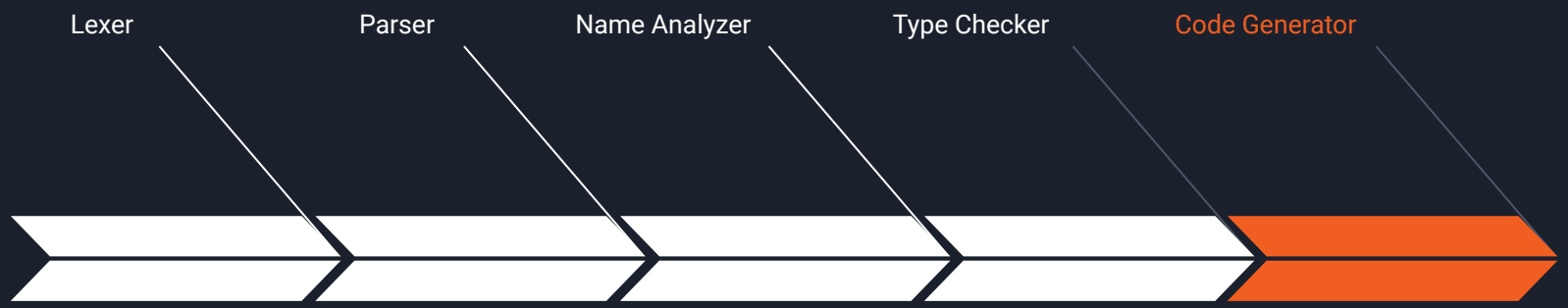


Lexer	Parser	Name Analyzer	Type Checker	Code Generator
parsing/Lexer.scala parsing/Tokens.scala	ast/TreeModule.scala ast/Printer.scala parsing/Parser.scala	analyzer/NameAnalyzer.scala	analyzer/TypeChecker.scala	codegen/CodeGen.scala
Add “Char” to the primitive type names.	Addition of type CharType and literal expression CharLiteral.	Add support for Char in step 3 (type discovering) and step 6 (module reconstruction).	Generate constraint for Char literals.	Push the char code (ASCII) on the stack.
Addition of the new token CharLitToken.	Add support in the printer.	Modifications were trivial: - no name, only literal values		
Addition of the pattern to match CharLitToken:	Add “Char” to the list of primitive types.			
(')(([^\\\n']) | ([\\][^\n]))(') ⇒ '{Char}' or '\{Char}'	Parse token CharLitToken to expression CharLiteral.			

Phase was modified

Phase was NOT modified

Added Built-in Functions



wasm/Module.scala
codegen/utils.scala

Functions that need access to global memory bound were written in codegen/utils.scala eg: toLowerCase

Functions that don't need access were added to the JS wrapper eg: length

Phase was modified

Phase was NOT modified

Added Built-in Functions

Why?

- Human interaction is mainly with Strings
- Optimising these operations results in huge speedup

Why these functions?

- Personal choice based on our experience
- Among multiple website's list of important string methods (ex: MDN, crio.do)

Built-in Functions

substring(

input: String,

start: Int(32),

end: Int(32)

): String

replace(

input: String,

searchValue: Char,

replaceValue: Char

): String

```
object StringOps

  Std.printString("Length of string <abcdefsg> ");
  Std.printInt(StringImpl.length("abcdefsg"));

  Std.printString("Replace a with b in  string <abcdefsaga> ");
  Std.printString(StringImpl.replace("abcdefsaga", 'a' , 'b'));

  Std.printString("Strip whitespace   string <  abcdefsg  > ");
  Std.printString(StringImpl.strip("  abcdefsg  ") );

  Std.printString("To lower case :   string <ABCaa234__Ssc> ");
  Std.printString( StringImpl.toLowerCase("ABCaa234__Ssc") )

end StringOps
```

Built-in Functions

strip(

input: String,

): String

toLowerCase(

input: String

): String

Console Output

```
Length of string <abcdefsg>
8
Replace a with b in  string <abcdefsaga>
bbcdefsbgb
Strip whitespace   string <  abcdefsg  >
abcdefsg
To lower case :   string <ABCaa234__Ssc>
abcaa234__ssc
```

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Future improvements / improvement ideas

- Support for new-line character and other escape sequence.
- Perform optimisations for concatenation of multiple strings (Perhaps something similar to stringBuilder)

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Thank you!

Merci !

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```
object Presentation

  val isPresentationDone: Boolean = true;

  val thankYouMessage: String = "Thank you for listening!";

  if (isPresentationDone) {
    Std.printString(thankYouMessage)
  }

end Presentation
```

Questions?