Algonquin College Logo

# SCHOOL OF ADVANCED TECHNOLOGY

### ICT - Applications & Programming

### Computer Engineering Technology – Computing Science



A11

Language Specification

Team:

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Language Name [Bust]

***This template is suggested (not mandatory) to answer A11 Specification.***

|  |  |
| --- | --- |
| **Part**  **1** | **Language User Reference** |

**EXPLANATION**

*The purpose of this assignment is to invent a new computer language.*

* *This language can have the syntax and structure of your choosing.*
* *Option 1: Adapt the ‘Mold language to be Rust compatible (see* <https://www.rust-lang.org/>*).*
* *Option 2: Define a* ***DSL*** *– Proper to solve specific problems (ex: science, economy, music, etc.)..*
* *This is going to be a fairly basic language. There's a lot of functionality that we'll be skipping over, while we implement the basics. You will need to tell me those basics, of course. In this document, I'm going to explain the steps of what to do with a bit of detail.*
  1. **User Manual**

**Element 1: Name / Extension**

*[Name your language! We suggest you use one "word" related to your “Rust-like” language or DSL]*

*[What is the filename extension of your language? For example, for C it is .c, and for Professor Paulo's “Mold”* ***language*** *it is ".****mld****".]*

*[What is your language patterned after, or what is it similar to? What languages are inspiring your choice? It's okay if you're following Rust closely.]*

***Answer:***

I would prefer to name my language as “Bust”. since I am a fan of Rust, I would like to name my language close to Rust. So, I changed the first character of Rust (R) to the first character of my name (B).

The extension is also very close to Rust, it would be “.bs”

**Element 2 – Comments**

*[Comments: I want to do comments in your language. How do I write them?]*

***Answer:***

I would like to use “//” as the sign of the start point of the comment

**Element 3 – Keywords**

*[Keywords: List the sequence of reserved / key words from your language]*

***Answer:***

1. ***selective structure:***

if, else

1. ***loop structure:***

while

1. ***function definition and its functionalities:***

fn

return

1. ***Boolean Keyword:***

true, false

**Element 4 – Datatypes**

*[Datatypes: Define integers, real numbers (float points) and strings. Determine their ranges]*

*[Remember to define the number of bytes – and, if possible, range]*

***Answer:***

|  |  |  |  |
| --- | --- | --- | --- |
| ***Data Type/Features*** | **Keyword** | **Range** | **Size** |
| **Integer** | i64 | -2,147,483,647 - 2,147,483,647 | 8 Bytes |
| **Character** | char | -128 - 127 | 1 Byte |
| **Float Point** | f64 | -2^128 ~ +2^128 | 8 Bytes |
| **String** | String | / | / |
| **Boolean** | bool | 1 | 1 Bytes |
| **Void** | NULL | / | 4 Bytes |

**Element 5 – Variables**

*[Variables: How would a programmer define variables that can hold integer numbers (numbers with no decimal point), floating point numbers (numbers with a decimal point) or text (ie: strings in Java). This is element 1. Consider if you want to flag the variables in a special way, like SOFIA or BASIC, or not, like C or Java.]*

***Answer:***

**There is no special way to flag a variable**

Variable can be defined by its data type keyword and its name with let.

The name of the variable can be only combined with digit and letter(uppercase or lowercase). The special character (space, sharp) and any keyword (int, if) are not allowed. Also, the name of the variable must begin with a letter.

For example:

let Int var = 1;

**Element 6 - Commands**

* ***Attribution / assignment****: How does your language let a programmer assign a value to a variable? (Will you allow casting? If so, how will it work?) How will your language handle math, and will it allow strings to be concatenated (merged)?*

***Answer:***

The value assignment would be performed by “=”.

The casting is allowed in my language. It would be performed by value casting itself with new data type.

For example: let float x = 10.1 x = int(x)

The language will perform the following basic arithmetic operations by:

plus (+), miner (-), multiplication (\*), division (/), module (%), power (^)

The concatenation of string is allowed, it can be perfozrmed by plus (+)

* ***Selection****: How does your language do if-style logic? (Optional: Do you want to do some kind of switch/case as well?). You will need to explain how "conditionals" work in your language. How do you write Boolean operations, such as "or", "and", "not", and other conditions, such as less than, greater than, etc?*

***Answer:***

The conditional will be simply performed by if else keyword:

If expression

{

} else {}

The Boolean Operations would be performed by:

And (&&), or (||), not (!), less than (<), greater than (>), equal (==), not equal (! =)

* ***Interaction****: How will your code handle looping? (You can do one or more of a for-style loop, a while/do loop, etc.)*

***Answer:***

The looping will be simply performed by while keyword:

while expression

{

}

* ***Input****: How does your program get input from the keyboard? (Strings are easiest.)*

***Answer:***

The standard input will be simply performed by read\_line function:

read\_line(variable)

* ***Output****: What would a programmer type to put output on the screen? What sort of variables or data will your code take?*

***Answer:***

The standard output will be simply performed by print function:

print!(variable/literal value)

* ***Functions****: [Function definition: parameters and returning types]*
  + *What will be the syntax for making a function or subroutine?*

The syntax to make a function would be “fn”

* + *How will it take parameters?*

It will take parameters after the function name. The in-take variable should be its datatype and data name.

* + *How will it return results?*

It will optionally return the results. If there is a result need to be returned, then leave the datatype of return value after in-take variable.

For example:

fn myFunction (int64 var1, int64 var2) int64

**Element 7 – Proper elements**

*[Include specific features / elements to be included in your language]*

* *What you could include / modify? Think about new datatypes / structures / commands, etc.*
* *Note: Do not share this info (it is supposed to be your proper elements in the language.*

The specific feature I wish to have in my language is while else

After the while loop be executed, the program will go to the else block

It should be performed by:

While expression

{

}

else

{

}

|  |  |
| --- | --- |
| **Part**  **2** | **Examples** |

**Option 1: Rust-like**

**Hello World**

|  |  |  |
| --- | --- | --- |
|  | [Your Code here]  fn main(){  print!(“Hello World!”);  } |  |

**Sphere Volume Expression (or any other example)**

|  |  |  |
| --- | --- | --- |
|  | [Your Code here]  fn main() {  let int pi = 3.141592653589793;  let float radius;  print!(“Radius of Sphere”)  read\_line(radius);  let float volume = (4.0/3.0) \* (pi \* radius ^ 3)  print!(volume)  } |  |

*[TIP: See examples in the Lecture Notes –* ***Appendix 1****]*

**Option 2: DSL**

**[Your example here]**

|  |  |  |
| --- | --- | --- |
|  | [Your Code here] |  |

|  |  |
| --- | --- |
| **Part**  **3** | **Architectural Aspects** |

**Advantages**

*[What's the goal of your language? Are you trying to make something simple, fun, complicated? My personal language, Chambly, is based around being useful to scientists. (You can just make something up here, honestly. Think about it a little bit, have a little fun.)]*

***Answer:***

To be honest, my goal is to make a simple enough programming language to help beginner learn basic programming. Also, the language should include some features of the other mainstream languages. These will help people to learn and get familiar with real programming without any panic. And, Once they fully understanding mine one, they can easily to learn the others.

**Strategy: C Implementation**

*[How your language can be implemented in C – ex: datatypes]*

* *In plain English, or maybe even some high-level pseudocode, how are you going to parse your language? You will be writing a compiler for your language, so these are some things you need to think about.*

*[Your ideas about how to identify elements from language]*

***Answer:***

In my thought, firstly my complier would read the code file line by line, and parse each word in each line of code. When it finds any keyword, then it will invoke the implemented functionalities to finish the task for that keyword.

For example:

->print!(“Hello World!”) ->Keyword : print!

The print keyword was found, invoke the functionalities to accomplish the printing.

* *Consider your "write to the console" command as an example. How will your compiler detect it? How will it sort out what to write to the console? What if there's some literal text (ie: "this is going to get printed") instead of variables?*

***Answer:***

In my opinion, the functionalities and implementation of the complier would be totally keyword based. It means the complier will keep searching for keyword in each line of code. And when it comes to the keyword the complier would invoke the corresponding functions for it. The things need to be printed should be managed in a pair of bracket (). The way to differentiate the variable and literal text I would use is double quote (“”). The literal should be managed into double quote and the variable not.

*[Your ideas about how to identify scope (ex: blocks between conditionals or functions)]*

* *How do you mark a block of code? If I use your loop logic, how do I control what portion of code gets looped through? In C, you might use { and }. In Python, the indentation is what matters. How does it work in your language?*

***Answer:***

In my opinion, I would prefer to mark a block is by symbol {}. Although indentation is an easier and more convenient way, but it will affect the readability in big project. In my language, when the complier detect the {}, it will treat that block as one single piece of code.

**Basic ideas about C implementation**

*[Which structures or datatypes you imagine to use in your language implementation]*

* *What do you think is going to be really hard about this? What would be, in your opinion, the hardest part of parsing your own new language? You don't have to write an essay, a paragraph or two will be fine.*

***Answer:***

I think the hardest part would be implementation of the functionalities of the keyword such as while and if else. Because it involves logical calculation and control. It not just a simple thing such as assign some memory for value. It needs to judge if the expression is valid and then control the program go the valid one.

***Note 1: C Datatypes***

*Remember that you are implementing your language in ANSI C. For this reason, you cannot create arbitrarily your language (from scratch). You need to use what is already provided by C Compiler. For this reason, think about using and defining the language obeying the datatypes.*

**Problems when using C implementation**

*[Your vision about main problems / difficulties when implementing a new language (ex: memory allocation, range of datatypes]*

***Answer:***

I think the biggest problem I would meet is to implement the datatypes of the new language which don’t exist in C. For example, string. I have carefully consider how to use the pointer to implement a pseud string datatype.

**FINAL SUGGESTIONS**

*Here some ideas to think about your language....*

* *Don't make this assignment harder than it needs to be on yourself. Focus on making the syntax for your language that meets our requirements. Worry about extra features later.*
* *Don’t worry if your new language winds up having really difficult parts. You'll be allowed to change your language as you go along, as long as you make "patch notes" to explain those changes. We'll tell you about this later.*
* *There's a marking key at the end of* ***CST8152\_Compilers\_W23-A11-Specification*** *that should steer you along for grades. Focus your efforts on where you'll get the best results.*
* *Finally, think about creating an “master-piece”: until now, you have used several languages. And if you have conditions to define yours, how it could be?*

**References**

*[Include eventual references used here]*

* *NOTE: Even if you use any tool (ex: ChatGPT), report here.*

Algonquin College

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