

VIREX (VIRtual EXecuter) is a platform-independent virtual machine designed around a flexible intermediate language called **SASM** (Simulated Assembly). It's inspired by the **Java Virtual Machine (JVM)**, but unlike JVM bytecode, SASM is **open, readable, and writable** — you can program directly in it.

What is SASM?

Just like Java compiles to bytecode for the JVM, any language can be compiled into SASM for VIREX. The difference is:




- SASM is **assembly-like**, human-readable, and editable.
- SASM is **open**, letting anyone build tools and languages around it.

You can even create your own programming language that compiles into SASM and runs anywhere VIREX runs — making your language instantly portable.

Why SASM?

- Learn how **assembly-level code** works through a clean and simplified syntax.
- Build a **compiler** without worrying about machine-level code generation.
- Make your own language **platform-independent** by targeting SASM.

Current Features

-  **VS Code syntax highlighter** for SASM
-  **AST visualizer** for seeing how your SASM code is parsed and compiled
-  A new programming language called **ORIN** is currently under development. It is being designed to compile directly to SASM.

If you're interested in compilers, language design, or virtual machines — **contributions are very welcome!**

Project Structure

```
/docs/      # Reference documentation
/examples/  # Sample programs
/include/   # Public headers for VM, SASM, OCC
/src/       # Core implementation (VM, assembler, compiler)
/tests/     # Simple Test programs written in SASM
/tools/themes/vs_code/ # VS Code syntax highlighter
/install.sh # Install script for linux
```

Getting Started (LINUX)

1. **Clone this repo:**

```
git clone https://github.com/Soham-Metha/virex.git
cd virex/
```

2. Build the project (requires **sudo**):

```
./install.sh
```

3. Run an example program:

```
cd ./examples/SASM/
virex
```

If the **TUI doesn't render properly**, try adjusting your **terminal font size**.


If that doesn't help, you can tweak layout values in **src/VM/vm_tui.c::CreateWindows()**.
The constants used are defined as **percentages** of the screen dimensions.

P.S. **kitty terminal** config, and font used, are available in **/tools**

4. Inside VIREX, do the following:

- Select **"Run SASM/ORIN command with custom flags"**
- Enter the following command:


```
-i helloWorld.sasm -I ./ -o tmp.sm
```

 use **Arrow keys** for navigation in menu.

- Select **"SASM build and exec"** by pressing **'a'**
- Enter the output filename (**tmp.sm**)

5. Activate the syntax highlighter in VS Code

- Open VS Code
- Press **Ctrl + Shift + P**
- Type: **Preferences: Color Theme**
- Select: **Palenight+sasm**

 Open any **.sasm** file in vs code to see the syntax highlighter at work!



Want to Contribute?

We're actively building:

1. The **ORIN** programming language
2. Improved **SASM tooling** (UI, debuggers, optimizers, etc.)
3. Expanded **Documentation** and **tutorials**

!!! info inline end ""

🔗 For contribution guidelines and a roadmap, see [CONTRIBUTING.md]() (coming soon).

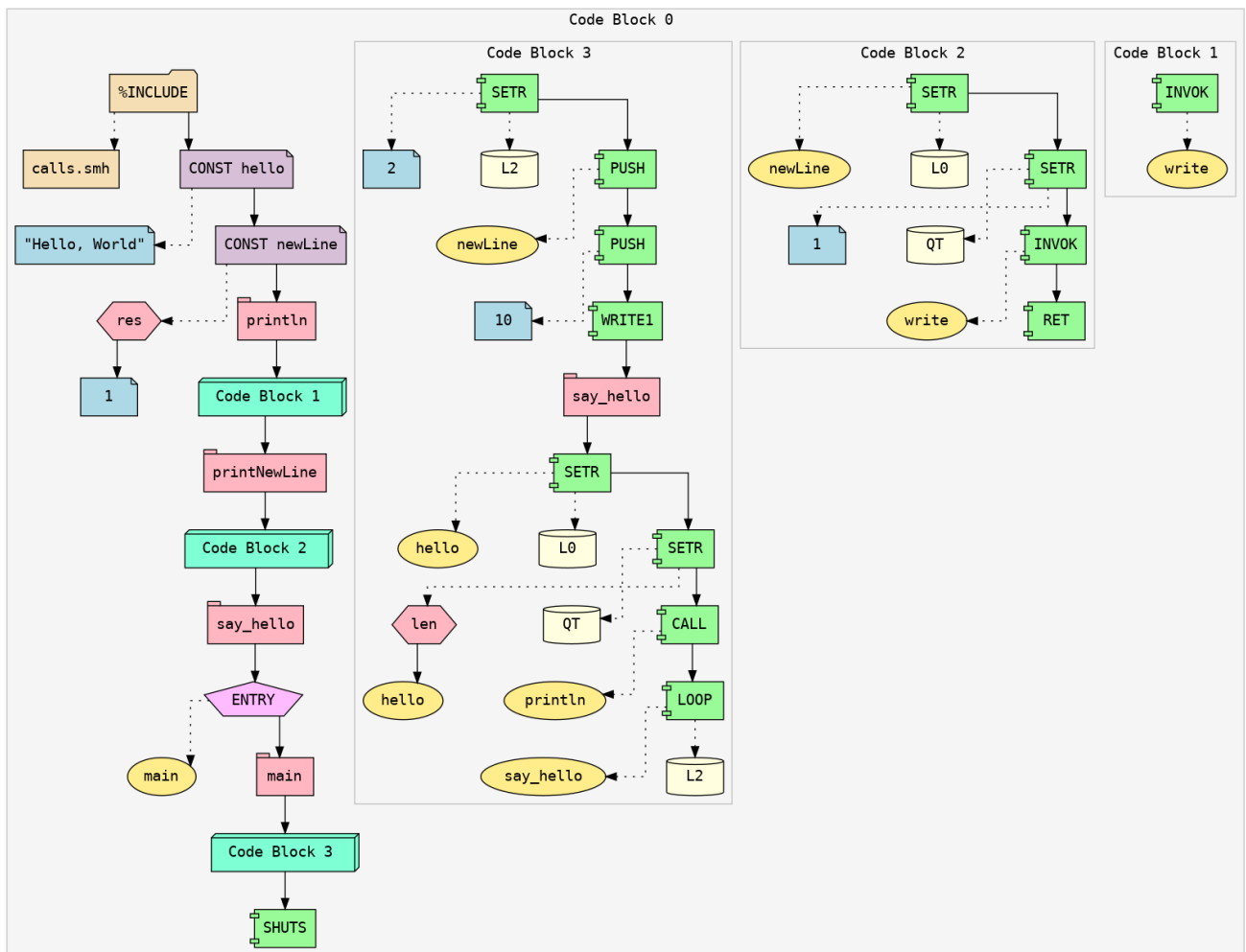
Examples

Syntax Highlighting:

```
helloWorld.sasm M X
extras > samplePrograms > helloWorld.sasm
You, 2 minutes ago | 1 author (You)
1  %include    "calls.smh"
2
3  %bind      hello      "Hello, World" ; Compile-time Escape characters not yet supported, specify at runtime instead
4  %bind      newLine    res(1)        ; reserves 1 byte in memory for the newline character
5
6  println:
7  %scope                                ; "write" is a integer const defined in 'calls.smh'
8      INVOK  write                    ; INVOK is used to invoke a syscall(vsyscall?)
9  %end                                    ; No RET here will lead to a fallthrough, printing a newline as well
10 printNewLine:
11 %scope
12     SETR    newLine    [L0]          ; SETR expects reference to a register(register ID), we can specify
13     SETR    1          [QT]          ; reference or value using ref([QT]) or val([QT]), default is ref()
14     INVOK  write                    ; Will print QT(QuantitY of) characters starting from location stored in L0
15     RET
16 %end    You, last month • Sasm Parser Rewrite done ...
17
18 say_hello:                                ; global 'say_hello'
19 %entry    main:                            ; inline define label 'main' as the entry point of the program
20 %scope    ; start local scope for main, optional, if not done, main runs in global scope
21     SETR    2          [L2]          ; SET Register 'L2' to 2
22     PUSH    newLine                    ; ptr to location
23     PUSH    10                        ; ASCII for newline
24     WRITE1  10                        ; Override 1 byte in memory, can use WRITE{1,2,4,8} depending on byte count
25 say_hello:                                ; local 'say_hello'
26     SETR    hello      [L0]          ; register L0 -> pointer to hello msg
27     SETR    len(hello) [QT]          ; register QT -> length of hello msg
28     CALL    println
29     LOOP    say_hello [L2]          ; Loop over label 'say_hello' - 'L2' times, P.S. zero inclusive
30 %end
31 SHUTS                                    ; SHUT System
32
```

{ width="400" }

AST:

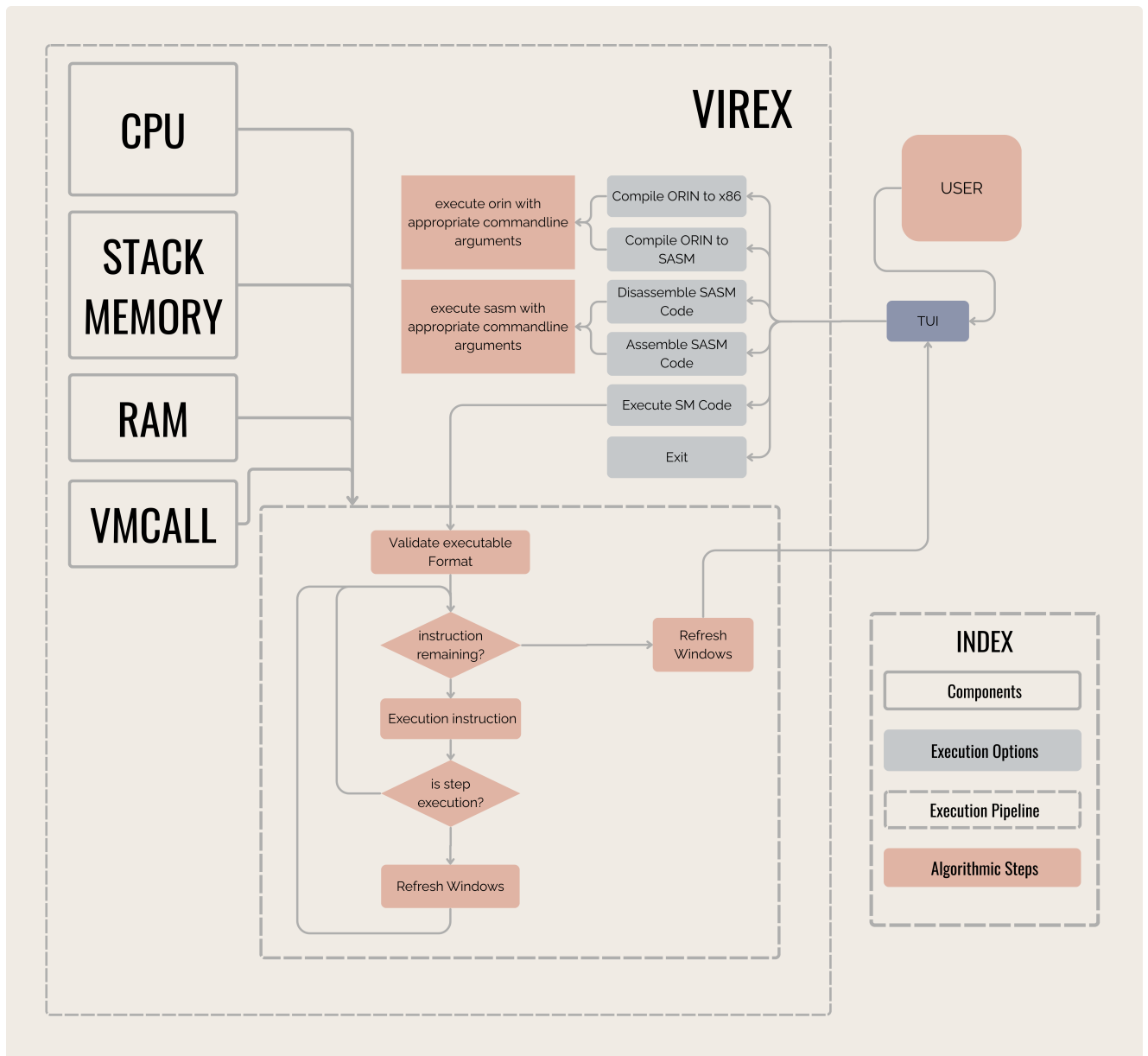


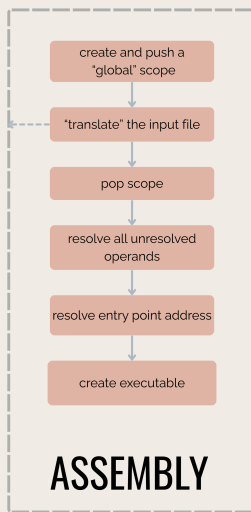
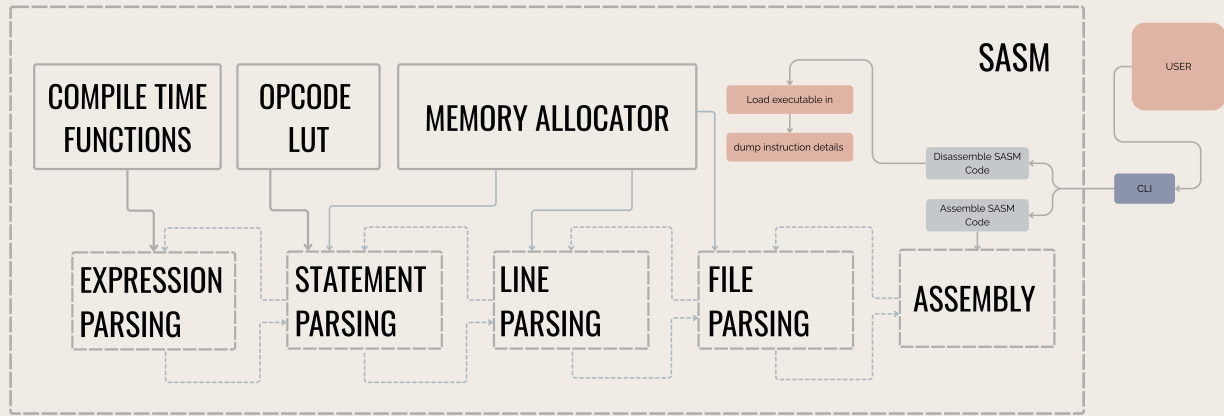
!!! info "Local/Global Scopes"

Each Code Block in the visualized AST represents a Scope, Block 0 being global scope.

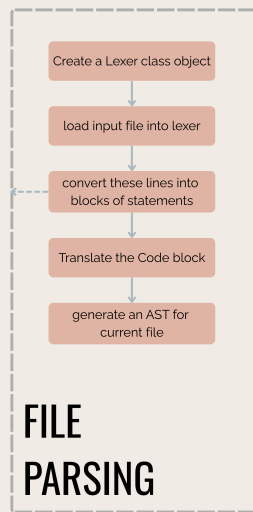
Binary Executable:

[illegible][illegible]

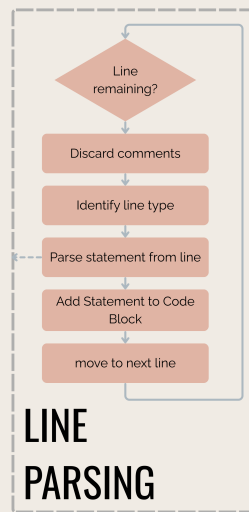




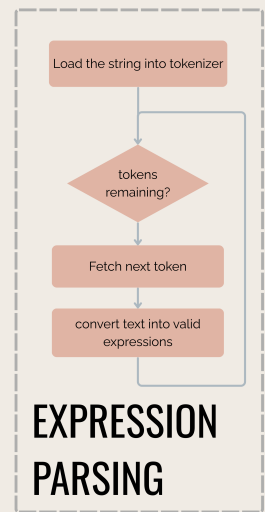
(a) Assembly Pipeline



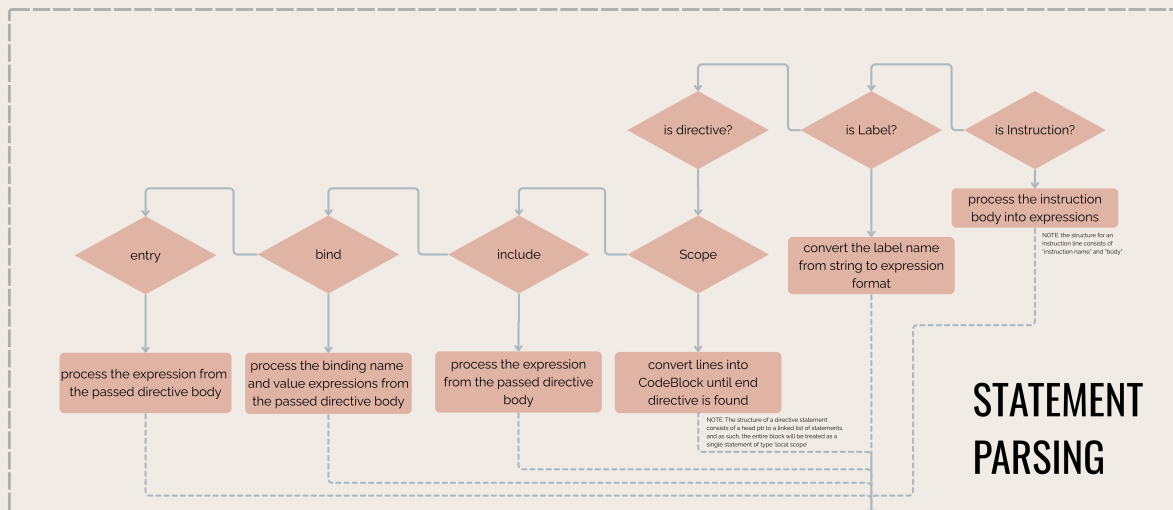
(b) File Parsing



(c) Line Parsing



(e) Expression Parsing



(d) Statement Parsing

Tech Stack

- **Programming Language: C**

- **Version Control:** Git
 - **Build System:** GNU Make
 - **AST VISUALIZER:** Graphviz
-

Maintainers

Tool	Maintainer
VIREX, SASM	Soham Metha
AST visualizer	Soham Metha
Syntax Highlighter	Soham Metha
ORIN Compiler	Omkar Jagtap
Core lib(Hashtable)	Omkar Jagtap
Core libs(other)	Soham Metha

References

- [Tsoding](#)
 - [Dr Birch](#)
 - [Low Byte Productions](#)
 - [Cobb Coding](#)
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