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 ""

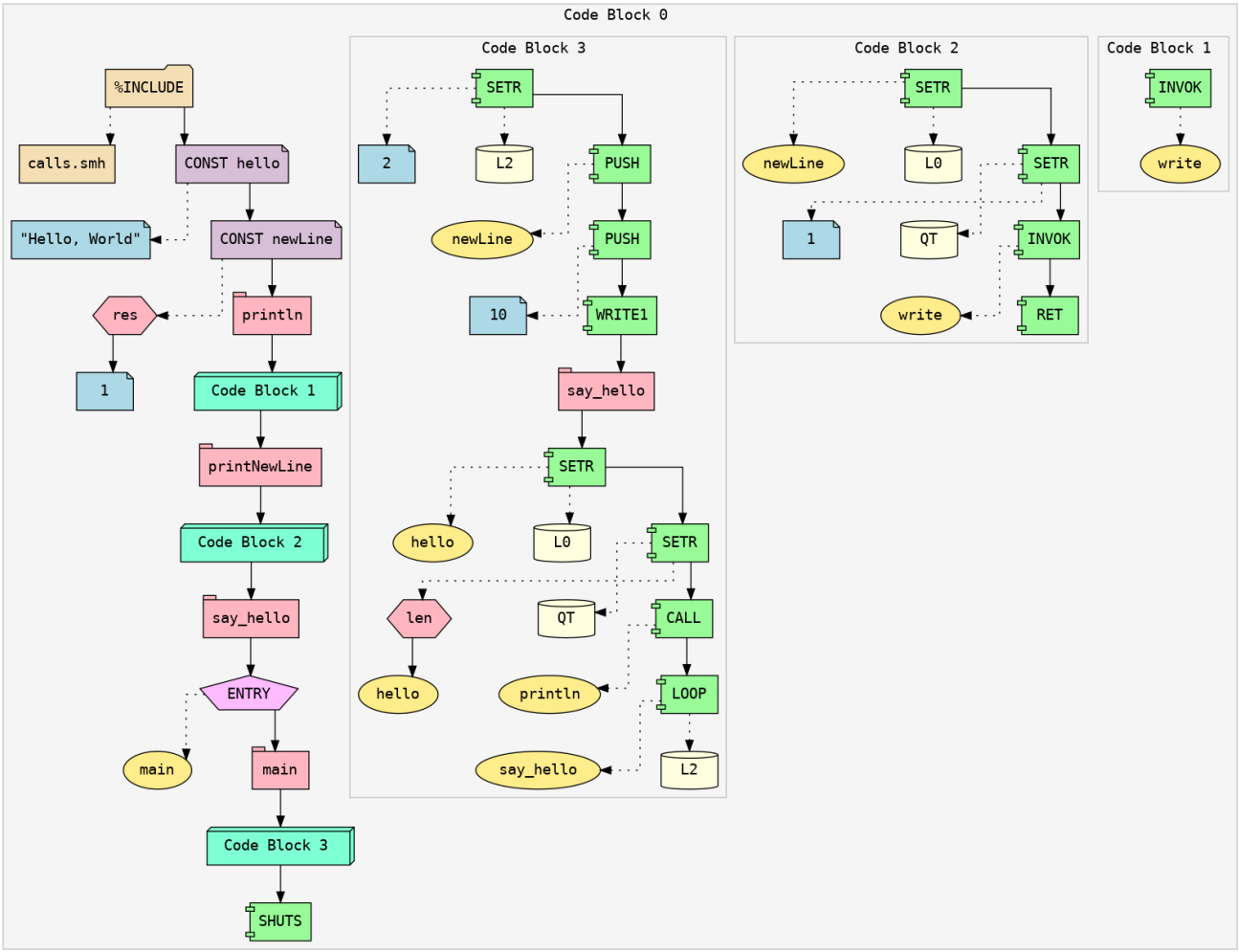
> 📌 For contribution guidelines and a roadmap, see [CONTRIBUTING.md]() (coming soon).

Examples

Syntax Highlighting:

{ width="400" }

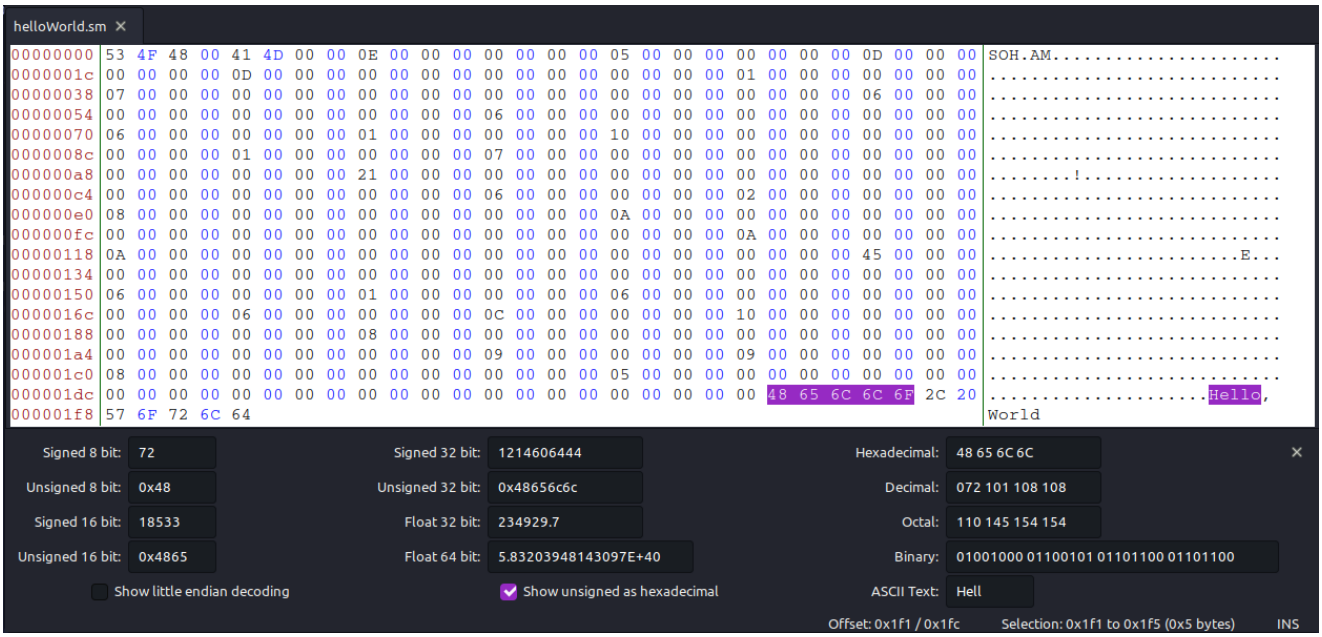
AST:



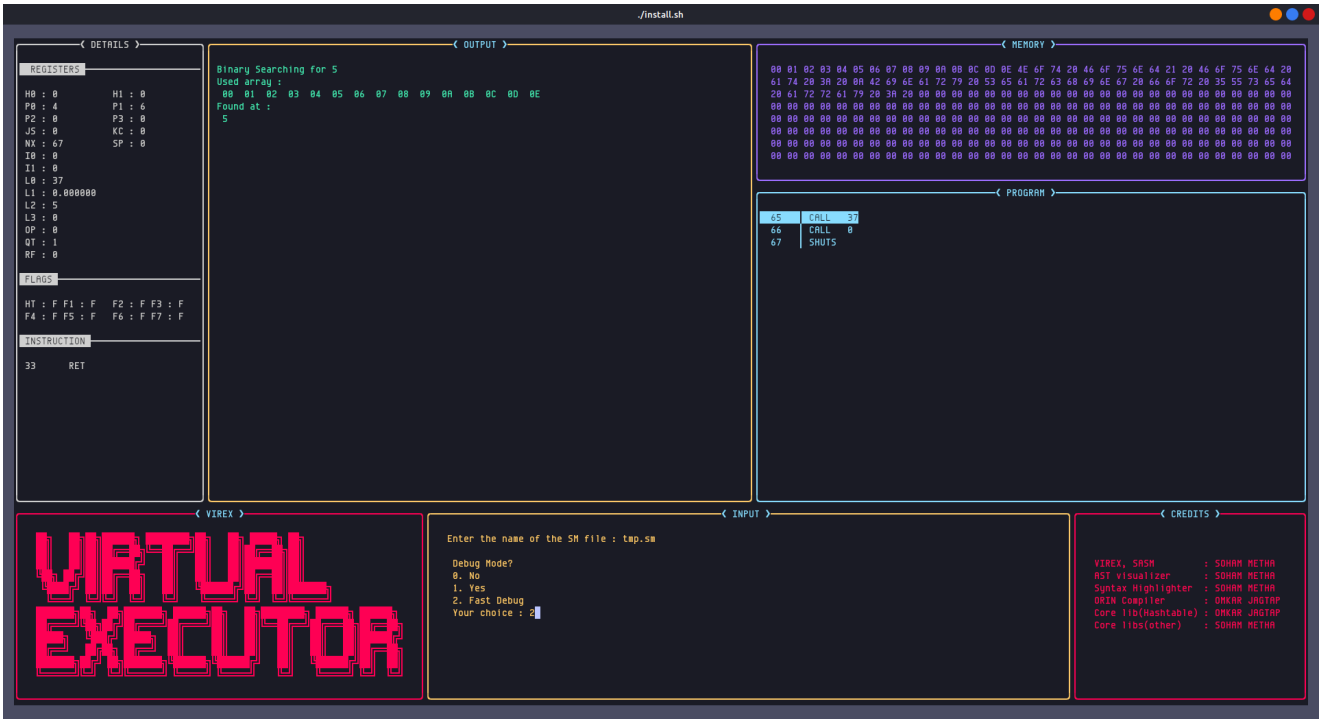
!!! info "Local/Global Scopes"

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

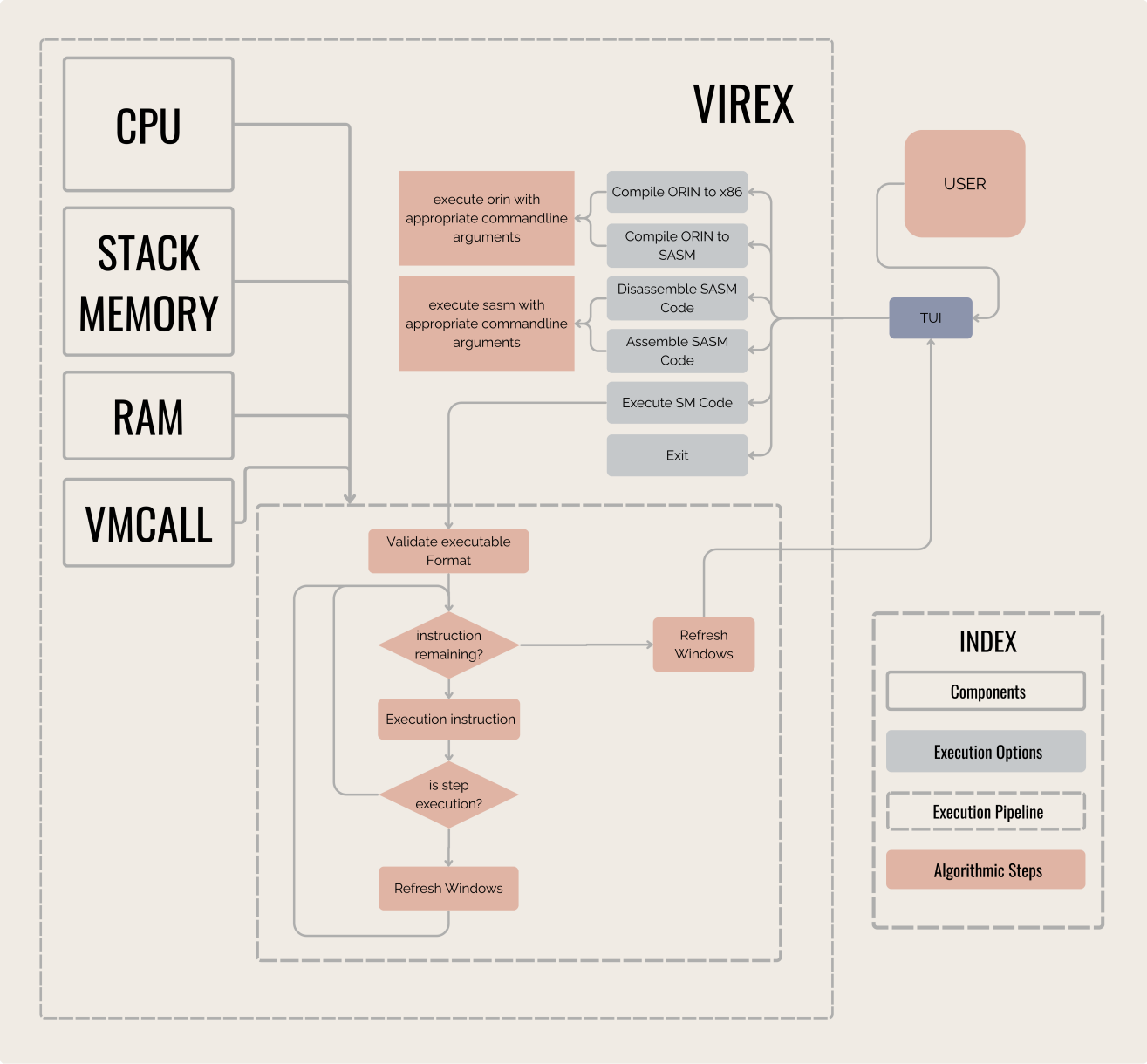
Binary Executable:

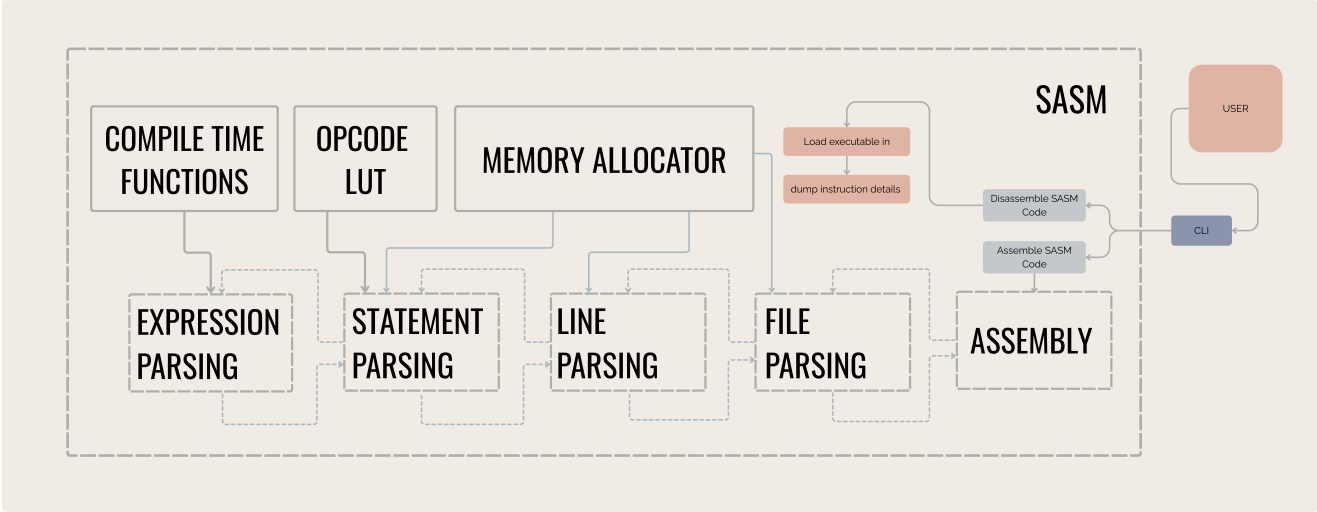


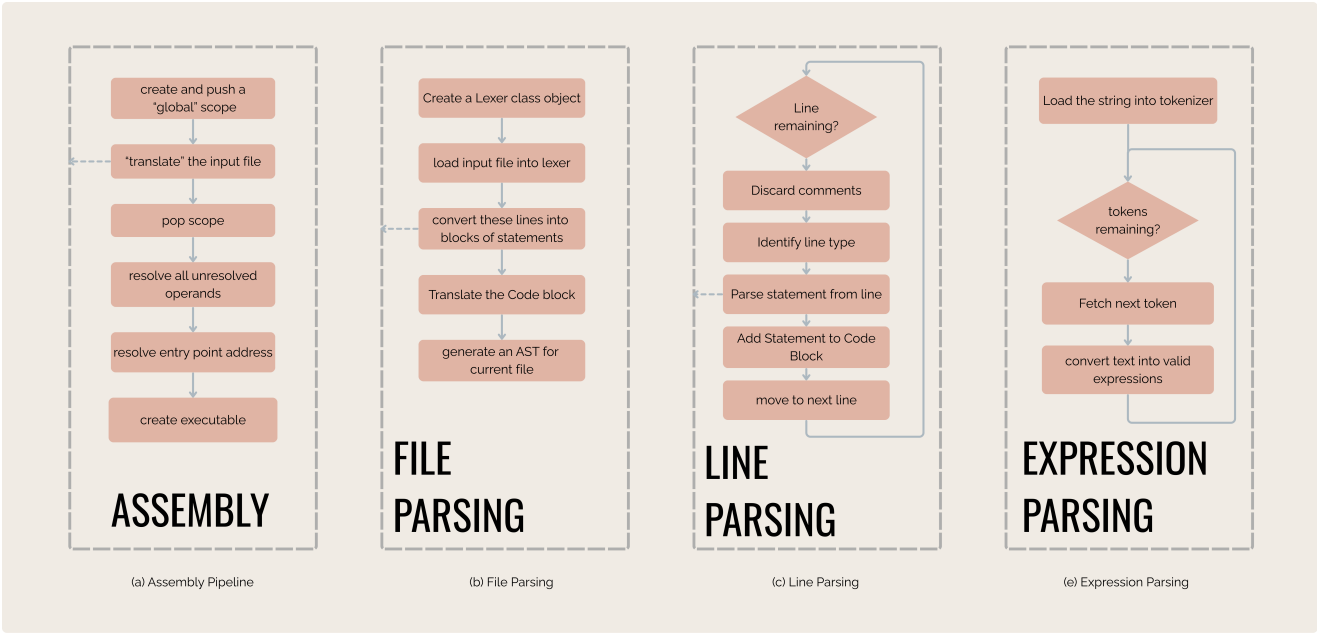
GUI:



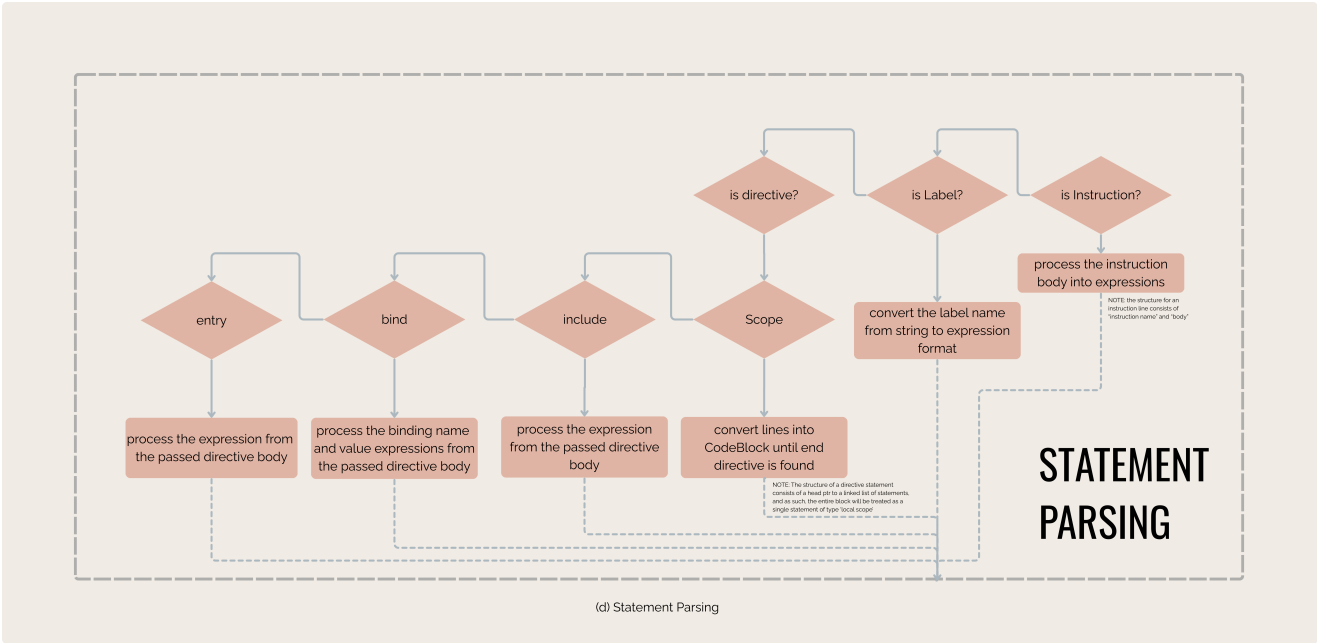
System Design and Architecture


VIREX
CPU
STACK MEMORY
RAM
VMCALL
USER
TUI
execute orin with appropriate commandline arguments
Compile ORIN to x86
Compile ORIN to SASM
execute sasm with appropriate commandline arguments
Disassemble SASM Code
Assemble SASM Code
Execute SM Code
Exit
Validate executable Format
instruction remaining?
Refresh Windows
Execution instruction
is step execution?
Refresh Windows
INDEX
Components
Execution Options
Execution Pipeline
Algorithmic Steps





(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
