

School of Computer Science and Engineering College of Engineering

# **Educational simulator**

# For analysing Pipelined LEGv8 architecture

Student: Chia Jia Tian

Supervisor: Dr Smitha Kavallur Pisharath Gopi

de Editor Instructions Datapath	Memory So	ource Settings		Registers
1 ADDI R2, R1, 0XA 2 ADDI R4, R1, #9	<ul> <li>Data</li> </ul>	⊖ Stack ⊖ Text	xo	0x0000 0000 0000 0000
3 ADD R1, R2, R4 4 B loop	Address	Value	X1	0x0000 0000 0000 0000
5 ADDI R1, R1, #4 5 loop: STUR R1, [R3, #8]	0x1000000	0x0000 0000 0000 0000	<b>X2</b>	0x0000 0000 0000 0000
7 ADDI R1, R1, #4	0x1000008	0x0000 0000 0000 0000	ХЗ	0x0000 0000 0000 0000
	0x10000010	0x0000 0000 0000 0000	X4	0x0000 0000 0000 0000
	0x10000018	0x0000 0000 0000 0000	<b>X5</b>	0x0000 0000 0000 0000
	0x10000020	0000 0000 0000 0000	X6	0x0000 0000 0000 0000
	0x10000028	0x0000 0000 0000 0000	<b>X</b> 7	0x0000 0000 0000 0000
	0x10000030	0x0000 0000 0000 0000	<b>X8</b>	0x0000 0000 0000 0000
	0x10000038	0x0000 0000 0000 0000	Х9	0x0000 0000 0000 0000
	0x10000040	0x0000 0000 0000 0000	X10	0x0000 0000 0000 0000
	0x10000048	0x0000 0000 0000 0000	X11	0x0000 0000 0000 0000
	0x10000050	0x0000 0000 0000 0000	X12	0x0000 0000 0000 0000
	0x10000058	0x0000 0000 0000 0000	<b>X13</b>	0x0000 0000 0000 0000
	0x10000060	0x0000 0000 0000 0000	X14	0x0000 0000 0000 0000
	0x10000068	0x0000 0000 0000 0000	X15	0x0000 0000 0000 0000
	0x10000070	0x0000 0000 0000 0000	X16	0x0000 0000 0000 0000
	0x10000078	0x0000 0000 0000 0000	X17	0x0000 0000 0000 0000
Output	0x10000080	0x0000 0000 0000 0000	X18	0x0000 0000 0000 0000

#### Features

- Code Editor
- Assembler
- Single Cycle & Pipelined
   Execution
- Pipeline Hazard Detecting
   & Handling
- Datapath Visualisation
- Error Checking & Logging

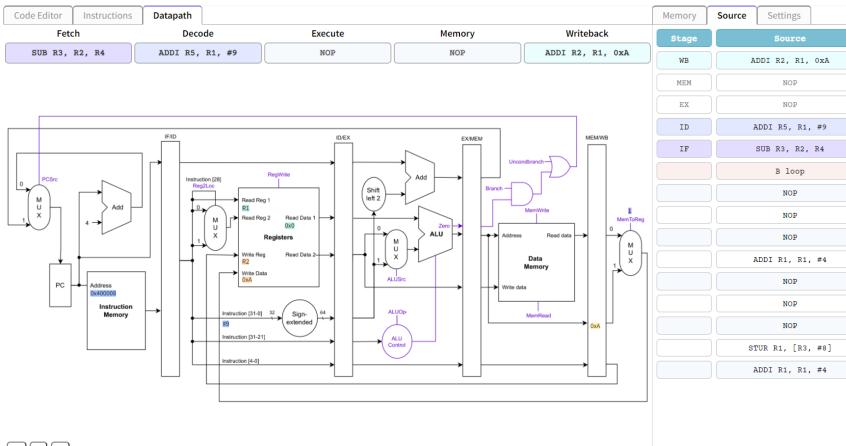
## **Motivation**

As computer architecture concepts are abstract and complex, there is a need for graphical, intuitive, and flexible teaching aids to supplement students' learning. However, there are currently no educational simulators built for the LEGv8 architecture.

Code Editor Instructio	ns Datapath			
Address	Instruction	Label	Source	Meaning
[W] 0x400000	0x22008CA5		ADDI x5, x5, 23	x5 = x5 + 35
[M]	NOP		NOP	
[E]	NOP		NOP	
[D] 0x400004	0xF8408041		LDUR x1, [x2, #8]	x1 = Memory[x2 + #8]

[F]	NOP	NOP	
	NOP	NOP	
	NOP	NOP	
0x400008	0xCB050024	SUB x4, x1, x5	x4 = x1 - x5
0x40000c	0x8A070026	AND x6, x1, x7	x6 = x1 & x7

#### **Pipelined execution of assembled instructions**



### **Objective**

Develop a web application that can be used by student to enhance their learning and understanding of computer architecture by providing them with a userfriendly and interactive medium to explore and learn the basic set of instructions that is supported by the LEGv8 architecture

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**Datapath Visualisation during Pipelined instruction execution**